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HISTORY OF ARKANSAS PTERIDOPHYTE STUDIES WITH A NEW ANNOTATED CHECKLIST AND FLORISTIC ANALYSIS

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ABSTRACT

This is the fifteenth pteridophyte flora published for Arkansas. The state pteridophyte flora now lists 123 species documented (98 native and 25 naturalized) with 3053 county-level records or map dots. The pteridophytes are the most studied, best known, and most completely documented group of plants in Arkansas (Peck 2011). The history of the compilation of the 123 species is presented, along with reports of two species new to the state and other noteworthy collections, an annotated checklist, and qualitative analysis of phytogeographic trends of the Arkansas pterdiophyte flora. The extensive bibliography provides easy access to the literature documenting Arkansas floristic research on pteridophytes.

KEY WORDS: Arkansas pteridophyte flora, ferns, fern allies, checklist, native species, naturalized species, checklist, and phytogeography

Pteridophytes (ferns and related spore producing plants) in Arkansas were studied first by naturalists, then general botanists, and only recently by pteridologists. Floristic studies in Arkansas have continued unabated over the last 200 years. Among the earliest are the Louisiana Purchase explorations up the Red River by Thomas and Peter Custis in1806 (MacRoberts & MacRoberts 2004, 2005), up the Ouachita River to Hot Springs in 1804—1805 by William Dunbar and George Hunter (Berry 2003, Berry, Beasley, & Clements 2006), and up the Arkansas River in 1806—1807 by Zebulon Pike (Jackson 1966). They made observations and collections that were sent back to President Jefferson and thence on to Philadelphia for examination and classification by Pursh. Voucher specimens of plants mentioned in their notebooks or journals are hard to locate and if they still exist were taken in part to New York, London, and Paris. Many have not been accounted for (MacRoberts & MacRoberts 2004).

Published reports of ferns and fern allies (Peck & Peck 1988; Peck, Witsell, & Foti 2001) in Arkansas date back to 1819 with the travels and collections of Nuttall (1821, 1835), who listed 23 species (Table 1) of pteridophytes from the Arkansas Territory (Foster 1944). Nuttall's efforts were limited to the vicinity of the Arkansas River and its valley (Beidleman 1956), yet he reported a list that included 20% of the state's pteridophytes. The Arkansas specimens were taken back to Philadelphia for study (Fernald 1942;Vaulx 1946; Pennell 1950). Some were deposited there and others were sent to London and Paris. Eventually the pillwort (*Pilularia*) and the waterclover (*Marsilea*) collected in Arkansas were published as species new to science, and some of the vouchers are presently housed at the Missouri Botanical Garden in St. Louis (MO). George Engelmann visited Arkansas in 1935 and again in 1937. He collected specimens on his way from St. Louis to Little Rock and to Hot Springs on at least two trips (Jansma & Jansma 1991, 1992) with vouchers housed at MO, also.

Two species reported by Nuttall remain enigmatic in that no vouchers were located to document their occurrence: *Botrychium fumarioides* and *Asplenium ruta-muraria*. Meaning of the

old name *B. fumarioides* remains equivocal. Today it is associated with the fern *B. lunarioides*, which Nuttall was unlikely to have found along his route of travel. It was not reported as part of the Arkansas fern flora for another 150 years. It may have been an early name confusion that persisted until 1950s, wherein plants of *B. biternatum* were mistakenly called *B. lunarioides* by many southern taxonomists.

We know which fern was meant by the name *Asplenium ruta-muraria*. A voucher by Nuttall has not been seen, although Nuttall's report is cited subsequently by many authors from out of state. Interestingly, another Arkansas collector reported the species in Arkansas (Lesquereux 1860). Lesquereaux's collections of this fern were seen and reported by a third collector (Harvey 1881), who reported as having seen Lesquereux's vouchers at University of Arkansas – Fayetteville's herbarium (UARK). These vouchers have disappeared as well. Since the 1880s, no vouchers were seen, found, or made of this species in Arkansas. Nuttall established 21 species of pteridophytes as present in the Arkansas flora that can be confirmed today with his extant specimens as documentary vouchers (Table 1.)

Table 1. The 21 ferns and fern allies listed by Nuttall (1835) for Arkansas with Nuttall's names and current names, along with 2 enigmatic species.

Nuttall's Names	Modern Names	Notes
1. Adiantum pedatum	Adiantum pedatum	
2. Asplenium ebeneum	Asplenium platyneuron	
3. Asplenium rhizophyllum	Asplenium rhizophyllum	
4. Asplenium melanocaulon	Asplenium trichomanes	
5. Aspidium filix-femina	Athyrium asplenioides	
6. Azolla americana	Azolla microphylla	
7. Botrychium obliquum	Botrychium dissectum obliquum	
8. Cheilanthes vestita	Cheilanthes lanosa	
9. Asplenium angustifolium	Diplazium pycnocarpon	
10. Aspidium marginale	Dryopteris marginalis	
11. Equisetum hyemale	Equisetum hyemale	
12. Marsilea undetermined	Marsilea vestita	
13. Ophioglossum vulgatum	Ophioglossum pycnostichum	
14. Osmunda cinnamomea	Osmundastrum cinnamomeum	
15. Osmunda spectabilis	Osmunda regalis spectabilis	
16. Pilularia sp.	Pilularia americana	
17. Polypodium incanum	Pleopeltis polypodioides	
18. Polypodium vulgare	Polypodium virginianum	
19. Aspidium acrostichoides	Polystichum acrostichoides	
20. Pteris aquilina	Pteridium aquilinum pseudocaudatum	
21. Woodwardia virginica	Woodwardia virginica	
Asplenium ruta-muraria	Asplenium ruta-muraria	[no voucher; excluded]
Botrychium fumarioides	Botrychium sp.	[no voucher; excluded]

The second botanist to provide a list of the ferns in Arkansas was the geologist and botanist Leo Lesquereux (1860), who stayed three months in Arkansas during a field survey, including a trip to Hot Springs, allowing him to collect additional rock-preferring species. Lesquereux (1860) listed

36 taxa, including seven for which either he did not voucher, the voucher was lost, or he felt that they must be in Arkansas, somewhere, even if he had not yet seen them in the state. Three taxa were noted as "should be here but not seen:" *Botrychium virginianum, Onoclea sensibilis,* and *Woodsia obtusa.*

Lesquereux reported *Asplenium ruta-muraria,* but no voucher is known today nor has the species been seen anywhere in the state in the 1900s. If it did occur here and was collected, the voucher noted by Harvey (1881) no longer could be found at the University herbarium at Fayetteville by the 1920s. Further enigmatic are two additional taxa reported by Lesquereux: *Dryopteris cristatum* and *Dryopteris carthusiana.* The former was reported from swamps in the southeastern part of the state. No voucher is known. This may have been *Dryopteris ludoviciana* or *Dryopteris celsa* or some other misidentified fern. At this time, the southern *Dryopteris* were not well known, and several species and their hybrids in the Gulf Coast states were mistakenly called *D. cristata* in Arkansas, Louisiana, and Texas. The latter species, *D. carthusiana,* is now known in Arkansas but not from areas visited by Lesquereux or Nuttall. At a latter date Harvey (1881) claimed to have seen a voucher for this species collected near Pine Bluff by G.E. Lytle, but these were exchange specimens that Lytle collected at Pine Bluff, New York. Likewise, Lesquereux (1860) reported *Selaginella rupestris* for Arkansas. Based on seeing Lesquereux's vouchers at UARK (University of Arkansas at Fayetteville), Harvey (1881) listed this spikemoss for Arkansas. Likewise Coville (Branner & Coville 1891) reported it, but all vouchers of these three species were lost from UARK by the 1920s. Again, without proper specimen records, there is no way to resolve these enigmas. Lesquereux (1860) added eight species to the 21 by Nuttall to form a total of 29 species documented with vouchers (Table 2).

Table 2. The eight vouchered ferns and fern allies Lesquereux (1860) added to those vouchered by Nuttall, along with seven enigmatic species.

Lesquereux's Names	Modern Names	Notes
22. Adiantum capillus-veneris	Adiantum capillus-veneris	
23. Asplenium pinnatifidum	Asplenium pinnatifidum	
24. Cheilanthes alabamensis	Cheilanthes alabamensis	
25. Cheilanthes tomentosa	Cheilanthes tomentosa	
26. Cystopteris fragilis	Cystopteris protrusa	
27. Allosorus atropurpureus	Pellaea atropurpurea	
28. Selaginella apus	Selaginella apoda	
29. Aspidium thelypteris	Thelypteris palustris	
Selaginella rupestris	Selaginella rupestris	[no voucher]
Aspidium cristata	Dryopteris cristata	[out of state, excluded]
Aspidium spinulosum	Dryopteris carthusiana	[no voucher]
Asplenium ruta-muraria	Asplenium ruta-muraria	[no voucher; excluded]
Botrychium virginianum	Botrychium virginianum	[no voucher]
Onoclea sensibilis	Onoclea sensibilis	[no voucher]
Woodsia obtusa	Woodsia obtusa	[no voucher]

Harvey (1881), the first plant taxonomist at the newly established (1872) land grant university at Fayetteville, started herbarium UARK and compiled and published the third list of Arkansas ferns. He annotated his list of 40 ferns (no fern allies) with notes on the ranges and habitats in Arkansas, with particular emphasis on northwestern Arkansas. Some, but not many, of Harvey's vouchers still exist today at UARK. Harvey (1881) added eleven species to the 29 pteridophytes

previously reported for Arkansas by Nuttall and Lesquereaux. Four species of enigmatic status were also reported: *Asplenium ruta-muraria, Aspidium cristatum, Aspidium spinulosum,* and *Botrychium ternatum* var. *lunarioides*. Harvey stated that he had Lesquereux's specimens of *Asplenium ruta-muraria* but without comment on where they were collected. Those specimens were lost by the 1920s.

According to Harvey (1881), the specimens vouchering *Aspidium cristatum* (*Dryopteris cristata*) were collected from near Pine Bluff by G.E. Lytle. Again, they have not been seen at least since the 1920s and no replacement collections from the vicinity of Pine Bluff in Jefferson County, Arkansas, or anywhere else in the state have been made or found since then. There are, however, specimens of *D. cristata* by Lytle received in exchange by Harvey from Pine Bluff, New York, still kept in "out-of-state" folders at UARK. These specimens may have been mistakenly reported as from Arkansas. The vouchers for *Aspidium spinulosum* [*Dryopteris carthusiana*] if they existed or were correctly identified, were lost by the 1920s. Lastly, while no vouchers exist to support the report of *Botrychium ternatum* var. *lunarioides*, this reference is significant. The earlier enigmatic report of *Botrychium fumarioides* by Nuttall (1935) could have referred to the southern grape fern *Botrychium biternatum*, not the much more northerly *Botrychium lunaria* nor the as of yet undiscovered and unnamed *Botrychium lunarioides*. The only other possible grape fern that Nuttall should have collected was *Botrychium virginianum*, but this was also explicitly listed by Harvey (1881) as new to the state. Again, without vouchers the identity of this grape fern remains enigmatic. Adding Harvey's eleven species new to Arkansas to the 29 of previous lists resulted in a new total of 40 pteridophytes known and vouchered from Arkansas (Table 4).

Table 4. Eleven ferns reported as new to Arkansas and vouchered by Harvey (1881) with four enigmatic species.

Harvey's Names	Modern Names	Notes
30. Notholeana dealbata	Argyrochosma dealbata	
31. Asplenium bradleyi	Asplenium bradleyi	
32. Asplenium parvulum	Asplenium resiliens	
33. Botrychium virginianum	Botrychium virginianum	
34. Cheilanthes lanuginosa	Cheilanthes feeii	
35. Cystopteris bulbifera	Cystopteris bulbifera	
36. Phegopteris hexagonoptera	Phegopteris hexagonoptera	
37. Onoclea sensibilis	Onoclea sensibilis	
38. Aspidium noveboracense	Parathelypteris noveboracense	
39. Woodsia obtusa	Woodsia obtusa obtusa	
40. Woodwardia angustifolia	Woodwardia areolata	
Asplenium ruta-muraria	Asplenium ruta-muraria	[no voucher; excluded]
Aspidium cristatum	Dryopteris cristata	[no voucher; excluded]
Aspidium spinulosum	Dryopteris carthusiana	[no voucher]
Botrychium ternatum var. lunarioides	Botrychium biternatum	[no voucher]

George Davenport (1883) prepared a literature-based enumeration of the 155 kinds of ferns known from all states in the USA at that time. His account included a list of the states and the number of each species known or reported from that state. He reported 41 species for Arkansas,

following closely the list prepared by Harvey (1881).

In the fourth list of Arkansas plants, Branner and Coville (1891) included 45 species of ferns and fern allies. Although working mainly in the Little Rock area, botanist Coville also made a trip to Independence County (vicinity of Batesville) and Stone County. He constructed the list for the state geologist, Branner. The list included all species, vouchered and enigmatic, reported by Nuttall, Lesquereaux, and Harvey, but as the list was prepared in Little Rock, their voucher specimens at UARK were not consulted. Branner and Coville (1891) mistakenly reported *Cheilanthes eatoni* from near Little Rock based on a misidentified specimen of *Cheilanthes tomentosa*. Thus they restated the known state flora and perpetuated and added errors (Table 4.) Thus, the known and vouchered state pteridophyte flora remained at 40.

Table 4. Four enigmatic ferns and fern allies were reported as new to Arkansas by Branner and Coville (1891).

Coville's Names	Modern Names	Notes
Asplenium ruta-muraria	Asplenium ruta-muraria	[no voucher; excluded]
Aspidium cristatum	Dryopteris cristata	[out of state; excluded]
Aspidium spinulosum	Dryopteris carthusiana	[no voucher]
Cheilanthes eatonii	Cheilanthes tomentosa	[specimen misidentified]

By today's standards, the four lists published in the 1800s were poorly documented. Voucher specimens were not specifically cited. Collection localities were vague or not provided. The original herbarium of deposit was not stated. Collections often were broken and sold in parts. Many Harvey specimens now exist at MO and some have been exchanged or given as gifts to other herbaria.

The UARK herbarium languished until the 1920s when it was exhumed by J.T. Buchholz. Buchholz reorganized the collection, compared what had been reported with what was vouchered, and started to document the state flora with county-level collections rather than a simple list of species. Buchholz visited the major research herbaria in St. Louis (MO), Chicago (F), Boston (GH), New York City (NY), Philadelphia (PH), and Washington, DC (US) to inspect their Arkansas specimens. In turn, these grand eastern institutions, such as the Arnold Arboretum of Harvard University, sent professional field collectors such as Ernest J. Palmer in the 1910s–1930s to augment mid-South and Arkansas collections in national collections. This action was continued as a Civilian Conservation Corps (CCC) project in the 1930s by professional field collectors supervised by professional botanists such as George M. Merrill, who collected extensively in the Little Rock area.

Buchholz (1924) revised the lists of Harvey and Branner and Coville and attempted to locate all herbarium vouchers for prior reports. He arrived at 46 species and 3 varieties of pteridophytes in Arkansas. Based on his list and voucher specimens, Buchholz (1924) added 4 species to the 40 mentioned so far. He noted that the Nuttall collection of *Pilularia americana* became part of the personal herbarium of Elias Durand and was purchased by MO, where Buchholz inspected it. Another Nuttall specimen was found at NY and was annotated to be correctly named as *Marsilea vestita* rather than as *Marsilea uncinata*. He found a voucher of *Ophioglossum vulgatum* by Nuttall (1835) and used it to demonstrate that a Harvey collection was of a species new to Arkansas, *O. engelmannii*.

Additional collections of species new to Arkansas were reported by E.J. Palmer (1932). He reported *Pellaea glabella* as new to Arkansas — collected by D. Demaree at Belle Vista, a new summer resort northwest of Bentonville. He added as new to the flora *Isoetes melanopoda* collected from Conway by H.E. Wheeler and from Fayetteville, along with *Isoetes butleri* collected from Little Rock by R.M. Harper and H.E. Wheeler. More importantly, Buchholz (1924) noted the absence of vouchers for seven species: *Dryopteris cristata, Dryopteris spinulosa* [carthusiana], *Asplenium montanum, Matteuccia struthiopteris, Cheilanthes eatonii, Marsilea uncinata,* and *Selaginella rupestris*. *Asplenium montanum* and *Matteuccia struthiopteris* were erroneously reported from Arkansas in a fern manual by J.K. Small and in Gray's Manual, respectively. With this report, the pteridophyte flora of Arkansas stood at 44 species (Table 5).

Table 5. The four species added to the Arkansas pteridophyte flora by Buchholz (1924), and the six species specifically deleted as they lacked vouchers.

Buchholz's Names	Modern Names	Notes
41. Ophioglossum engelmannii	Ophioglossum engelmannii	
42. Pellaea glabella	Pellaea glabella	
43. Isoetes melanopoda	Isoetes melanopoda	
44. Isoetes butleri	Isoetes butleri	
Dryopteris spinulosa	Dryopteris carthusiana	[no voucher]
Dryopteris cristata	Dryopteris cristata	[out of state; excluded]
Matteuccia struthiopteris	Matteuccia struthiopteris	[no voucher; false report]
Cheilanthes eatonii	Cheilanthes tomentosa	[misidentified specimen]
Marsilea uncinata	Marsilea vestita	[misidentified specimen]
Selaginella rupestris	Selaginella rupesris	[no voucher]

Buchholz's study was immediately followed by Palmer's (1924) report of two species he found new to the state, which occurred widely in eastern North America but were disjunct in their occurrence at the top of Magazine Mountain, Logan County, Arkansas: *Dennstaedtia punctilobula* and *Woodsia scopulina*. These additions were incorporated in a supplemental list of plants new to Arkansas by Buchholz and Palmer (1926). This list was the first Arkansas flora report that referred to specific voucher specimens by collector, collection number, and herbarium of deposit. They commented on 15 species, reported five as new to Arkansas, and noted that there were 51 pteridophytes in the state flora. They were the first to note the second variety of bracken fern in Arkansas was *Pteridium aquilinum* var. *latiusculum*. They also reported *Equisetum prealtum* and *E. intermedium* based on identifications of *Equisetum* monographer J.H. Schaffner. The former is the species *E. hyemale* var. *affine,* found across the USA, while the latter is one of the names given to *E.* ×*ferrissii* before its hybrid biology was settled. Of note, Dwight Moore's recent collection of *Dryopteris spinulosa* [*carthusiana*] at Magazine Mountain re-instituted this species in the flora, but prior vouchers were not located. With this report, the vouchered pteridophyte flora of Arkansas now stood at 49 (Table 6).

Table 6. Five pteridophytes reported as new to Arkansas by Buchholz and Palmer (1926) — or once enigmatic but now vouchered.

Buchholz's Names	Modern Names	Notes
45. Botrychium dissectum var. dissectum	Botrychium dissectum var. dissectum	
46. Dryopteris spinulosa	Dryopteris carthusiana	[new specimen]
47. Dennstaedtia punctilobula	Dennstaedtia punctilobula	
48. Equisetum intermedium	Equisetum ×ferrissii	
49. Woodsia scopulina	Woodsia scopulina	

Scully (1937, 1939) produced two papers describing 18 and then 26 ferns and fern allies found in and around Hot Springs National Park. He reported the presence of the more northern lady fern known as *Athyrium filix-femina* var. *angustum*, common across northeastern North America, based on a specimen he had sent to J.K. Small for annotation. No voucher has been found. All other Arkansas material at that time was identified as var. *asplenioides*, which is common across southeastern North America. Interestingly, Scully did not notice the Spider Brake Fern, which was found there by Chandler (1941) as a recent escape now naturalized. Chandler was looking for *Cheilanthes alabamense,* which he could not find until aided by Scully. Thus, Scully and Chandler could not locate *Pteris multifida* and *Cheilanthes alabamensis* without help, whereas they are both quite common in the park today.

At the end of the 1930s, Dwight Moore (1940) published a brief note on whether *Selaginella rupestris* was part of the flora and properly vouchered. Buchholz (1924) determined that there were no vouchers to support its listing by earlier Arkansas botanists. Based on his study, Moore indicated that the first vouchered material was collected by Delzie Demaree in 1927 from Izard County and in five additional counties since then. None of these were visited by Lesquereux (1860), who had suggested that the species occurred in Arkansas.

In a new attempt to summarize past efforts with more field status notes, Dwight Moore (1940) provided an annotated checklist to 67 ferns and fern allies. The list was proper for its time, when there were many superfluous varietal names and much confusion as to the correct name for a species in the genera *Equisetum* and *Botrychium*. For example, the plant known as the modern hybrid *E. ×ferrissii* was called *E. hyemale* var. *intermedium* and *E. laevigatum* by various workers, including J.N. Schaffner who mistypified North American material and remained confused until corrected by Richard Hauke in the 1960s. Moore (1941) reported both forms of *Botrychium dissectum*; the other two leathery grape ferns he reported most probably referred to *B. biternatum* and *B. multifidum*. The latter was erroneously based on a single problematic frond which was clearly not the more northerly species but another frond of *B. biternatum*. Again, the true *B. lunarioides* was still unknown from Arkansas.

Moore (1940) reported six species as new to Arkansas (including *Selaginella rupestris*) and nine enigmatic species. After a ten year search, Moore located *Osmunda claytoniana* in 1936 near where Buchholz had seen it picked and displayed in a vase in Pope County. Moore reported his discovery of *Equisetum arvense* in 1935 in Washington County. He reported that Flora A. Haas of Arkansas State Teachers College (now University of Central Arkansas) discovered *Lycopodium appressa* in 1931 from Saline County. Significantly, Moore (1940) mistakenly noted that the rare

Dennstaedtia punctilobula had been reported from Pine Bluff. Because that specimen still exists, it is possible to correct the literature. The fern was collected and mistakenly named as *Dicksonia punctilobula*, an earlier name no longer used, but the fern actually was a specimen of the common *Phegopteris hexagonoptera*. Without that specimen there would have been no way to eliminate this error from the literature. Although reported earlier by Harvey (1881), no vouchers could be found to substantiate the listing of *Cheilanthes feeii* in the Arkansas flora until E.J. Palmer recollected or first collected it in 1927. Although not involved with its discovery, Moore (1940) listed the mysterious *Dryopteris* called the "Palmer Fern" found by Demaree and Palmer near Shirley, Arkansas. In 1940, no one knew where the fern was in the state or could find it. It remained "lost" until rediscovered by W.C. Taylor at the same location at Shirley (Wagner & Taylor 1976; Taylor 1982). Lastly, Moore (1940) reported *Asplenium ×ebenoides* as new to the state based on a personal collection from Crawford County in 1937, but no voucher of this find has been found since then. Thus, with Moore's efforts, the reported and vouchered Arkansas pteridophyte flora based on modern species concepts then consisted of 55 kinds (Table 7).

Table 7. Six species were added by Moore (1940) to the Arkansas pteridophyte flora, along eight excluded species.

Moore's Names	Modern Names	Notes
50. Dryopteris clintoniana var. australis	Dryopteris ×leedsii	"Palmer's Fern"
51. Equisetum arvense	Equisetum arvense	
52. Lycopodium appressum	Lycopodiella appressa	
53. Osmunda claytoniana	Osmunda claytoniana	
54. Pteridium aquilinum var. latiusculum	Pteridium aquilinum subsp. latiusculum	
55. Selaginella rupestris	Selaginella rupestris	[reinstated; new voucher]
Asplenium ×ebenoides	Asplenium ×ebenoides	[no voucher; excluded]
Asplenium cryptolepis	Asplenium ruta-muraria	[no voucher; excluded]
Athyrium angustum	Athyrium asplenioides	[misidentified; excluded]
Botrychium dissectum var. tenuifolium	Botrychium biternatum	[no voucher, excluded]
Botrychium multifidum var. silaifolium	Botrychium sp.	[no voucher; excluded]
Cheilanthes feeii	Cheilanthes feeii	[reinstated; new voucher]
Cystopteris fragilis fragilis	Cystopteris tennesseensis	[misidentified; excluded]
Dryopteris cristata	Dryopteris cristata	[no voucher; excluded]
Equisetum laevigatum	Equisetum ×ferrissii	[misidentified]

Moore (1941) also published a paper entitled "Some Noteworthy Fern Communities of Arkansas," which included lists of species found in five different localities within the Interior Highlands. First, he updated Scully's lists of the ferns of the Hot Springs area in Garland County by adding five species for a total of 31 species. Second, he reported 27 species from Magazine Mountain in Logan County. Third, he reported 15 species in a circle with a radius of 50 feet at Sand Gap (Pelsor) in Pope County. Fourth, he reported 14 species above on Martin's Bluff in Benton County and 20 species below. Fifth, from Savoy in Washington County he reported nine species on a north-facing slope and eleven species on a south-facing slope. He concluded with a list of 18 rare Arkansas

pteridophytes and their general locations.

Delzie Demaree, whose contributions to Arkansas botany spanned five decades, almost single-handedly vouchered most state county records known at that time for the vascular flora, adding many tens of thousands of specimens to Arkansas and out-of-state herbaria. Most collections were written using the local post office as a reference point, as there were few other places of permanence. "Doc" was of the opinion that if you were any good at all in the field, you could find it on your own, given the nearest post office. He spent considerable time in the 1920s and 1930s with Buchholz and Palmer documenting the Arkansas flora, species by species, county by county. He did not publish much; he let his collections speak for themselves (Taylor 1982).

Demaree (1943a) published a brief note on Arkansas ferns that added *Cystopteris fragilis* var. *simulans* to the state flora. Only four years earlier John Shaver (1939) elevated this variety to species rank with the name of *Cystopteris tennesseensis*. Demaree collected this plant in Stone Co. in 1942. Earlier specimens by Demaree of this taxa from Magnet Cove, Hot Spring Co., were mistakenly identified as *Cystopteris fragilis* var. *fragilis* by Moore (1940). Demaree (1943a) also noted his collections of five other rare Arkansas ferns not included in Moore (1940).

Demaree (1943b) compiled a summary list of all plants ever reported from Arkansas in a personal, private publication named Taxodium, or "Catalogue of Vascular Plants of Arkansas." He listed 70 taxa of ferns in 30 genera, including all misnamed and enigmatic collections in the inventory, and noted the clarification of the correct species name of *Cystopteris* in Arkansas (Table 8). Demaree continued to collect and send specimens to specialists and by 1974 Demaree's collection numbers exceeded 74,000. He collected plants for another 12 years beyond that without collection numbers, so his life total was probably near 80,000 numbers, and most of those with 5–10 duplicates sent nationwide. No other Arkansas botanist then or since has come close to this level of dedication to collecting and documenting the Arkansas flora. He did this without maps, without owning or driving a car while botanizing, and even in summer he ran his internal home floor furnace full blast to dry multiple presses indoors, with the windows closed to save energy! It was a distinct honor and privilege to know "Doc".

Since the early 1940s, modern research methods in plant taxonomy and systematics led to a new effort to study plants in their native habitats and with quantitative methods. These led to many revised species concepts, nomenclatural changes, and monographs on taxonomically difficult genera. With improved roads and better tires, field work improved in Arkansas, resulting in nearly a dozen additional pteridophytes reported as new to the state from 1940 through 1976, including those reported by Chandler (1941), Demaree (1943a), Moore (1947, 1950, 1951, 1957, and 1958), Moore and Hartsoe (1955), Wagner (1962), Clark (1962), Bowers and Redfearn (1967), Farrar and Redfearn (1968), Tucker (1971), and Wagner and Taylor (1976) and summarized in Table 8.

Moore (1947) reported many critical discoveries to rare and enigmatic species and added two species to the Arkansas pteridophyte flora (Table 8). Moore's collection of *Pilularia americana* in 1942 was its second collection in Arkansas — the first being in 1819 by Nuttall — after an absence of 123 years! It was discovered in a lake that was only five years old. Moore (1947) found *Athyrium thelypterioides* in 1942 on Magazine Mountain, Logan Co, to provide the first voucher for this species in Arkansas. Moore (1947) reported another collection of *Marsilea vestita* by Demaree from Arkansas Co. and the second state collection of *Equisetum arvense* by Demaree at St. Francis Co. and the third by Moore from Stone Co. Moore (1947) also reported new collections to voucher old reports of *Anchistea virginica* [*Woodwardia virginica*] and *Asplenium pinnatifidum,* wherein their old vouchers were lost or never collected.

Lastly, while confirming this last spleenwort at Pea Ridge National Military Cemetery, Moore (1947) encountered in 1943 an unusual fern that appeared to be a hybrid. After consultation with national fern experts such as E.T. Wherry, Moore (1947) reported it as *Asplenium ×stotleri.* Wherry told W.H. Wagner about this odd fern. Wagner was unraveling the mysteries of the reticulate relationships of Appalachian Aspleniums and eventually annotated this plant in 1953 as *Asplenium ×kentuckiense*, the central triploid hybrid composed of three different species genomes, being the last major problem to be resolved in this complex (Wagner 1958).

On 12 April 1945, Dwight Moore (1950) discovered as new to Arkansas a minute fern which was identified for him as *Ophioglossum crotalophoroides* by C.F. Reed in March 1946 at St. Louis at a national meeting of the American Fern Society. Moore (1951) reported five recollections of rare ferns and other plants in Arkansas. Jewel Moore and Hartsoe (1955) reported *O. crotalophoroides* as a second state record from Faulkner Co. D. Moore (1957) reported it in five more counties and then (1958) in three more counties, for a total of 10 counties.

Demaree made the first state collection of *Trichomanes boschianum* on 20 August 1961 from Cleburne Co., in a locality disjunct by more than 200 + miles to the west of the nearest populations in Illinois and Alabama (Wagner 1962). Eight months later, in February 1962, Maxine Clark discovered this fern in Madison Co, 100 miles to the west of Demaree's locality (Clark 1962).

Frank Bowers and Paul Redfearn (1967) reported the second clubmoss species known from Arkansas when they reported *Lycopodium lucidulum* as present in Franklin and Madison counties. They were searching for mosses as part of their survey of the mosses of the Interior Highlands.

Don Farrar and Paul Redfearn (1968) reported as new to Arkansas the minute filmy fern *Trichomanes petersii* which they discovered in Pope Co, again while searching for moss records. While they did not know this, this was the same locality where Dwight Moore had discovered *Osmunda claytoniana* some 32 years earlier. This population was also disjunct from populations in Illinois and Alabama.

Wagner and Wagner (1969) included a discussion on *Asplenium bradleyi* with unusual leaf morphology found at Blanchard Springs found by D.R. Farrar. They suggested that some of the plants might be the first report of the sterile diploid progenitor of the fertile tetraploid that is common in Arkansas and widespread in eastern North America. Subsequent work proved that these plants were unusual but tetraploids as well.

Gary Tucker (1971) discovered a second spikemoss for Arkansas on 16 September 1967 when he discovered *Selaginella arenicola* subsp. *riddellii* at Pussy Point on Norristown Mountain in Pope Co. and at a sand barren near Chidester in Ouachita Co. on 19 April 1969. Prior to this the species was only known from Louisiana, Oklahoma, and Texas.

W.C. Taylor and Delzie Demaree relocated the mysterious Palmer *Dryopteris* in August 1974 at Shirley (Wagner & Taylor 1976). It had been visited for eight years after its discovery in 1928 by Palmer and Demaree but after a drought and cattle grazing was not seen since 1936 and its location was "lost." In 1964 Paul Redfearn and W.H. Wagner attempted but failed to relocate this fern, which had been conflictingly named 13 different things by fern experts in the interim (Peck 2000). After its rediscovery, Wagner confirmed that it was *Dryopteris ×leedsii*, a very rare fern hybrid (Wagner & Taylor 1976; Taylor 1982).

With so many species reported as new to Arkansas and with a need to reexamine all herbarium specimens in the light of a new nomenclature, a serious reappraisal of the Arkansas

pteridophytes was needed. W.C. Taylor undertook this project as part of his doctoral program at Southern Illinois University under Dr. Robert Mohlenbrock. Taylor inspected and annotated all herbarium specimens within Arkansas and in many national institutions in the USA. He surveyed old collection locations, collected new vouchers, and attempted to document all old records of Arkansas pteridophytes (Wagner & Taylor 1976). Dr. Demaree showed Taylor how to "scratch gravel" across the rugged Arkansas terrain (Taylor 1982, 1984). Several updates were prepared to summarize studies on variation in quillworts and spleenworts (Taylor et al. 1975, 1976).

Taylor's dissertation (1976) provided a new standard for floristic knowledge of 73 Arkansas pteridophytes, clarified many enigmatic species, and included eight species new to Arkansas reported previously since the list by Moore (1940) as well as three taxa new to Arkansas but previously unreported (Table 8). Taylor (1976) reinstated *Asplenium ×ebenoides* based on a collection by David Johnson, clarified the confused grape fern situation by adding *Botrychium biternatum*, and noted the presence of *Dryopteris celsa* in Arkansas wherein it had been collected in 1924 but overlooked in an out-of-state herbarium. Taylor (1976) also documented his work at the county level by recording vouchers to 1321 county records and displaying them on county dot-maps. These eleven pteridophytes, added to the previous total, brought the known state pteridophyte flora to a total of 65 species plus hybrids (Table 8).

Table 8. Since Moore (1940), eleven additions were made to the Arkansas pteridophyte flora in the 1940s through early 1970s. These were summarized in Taylor (1976).

Taylor's Names	Modern Names	First Report
56. Pteris multifida	Pteris multifida	Chandler (1941)
57. Cystopteris tennesseensis	Cystopteris tennesseensis	Demaree (1943a)
58. Asplenium ×kentuckiense	Asplenium ×kentuckiense	Moore (1947)
59. Athyrium thelypterioides	Deparia acrostichoides	Moore (1947)
60. Ophioglossum crotalaphoroides	O. crotalaphoroides	Moore (1950)
61. Trichomanes boschianum	Trichomanes boschianum	Clark (1962); Wagner (1962)
62. Lycopodium lucidulum	Huperzia lucidula	Bowers & Redfearn (1967)
63. Trichomanes petersii	Trichomanes petersii	Farrar & Redfearn (1968)
64. Selaginella arenicola	Selaginella corallina	Tucker (1971)
65. Botrychium biternatum	Botrychium biternatum	Taylor (1976
66. Dryopteris celsa	Dryopteris celsa	Taylor (1976)
Marsilea quadrifolia	Marsilea vestita	[misidentified; excluded]

Smith (1978) prepared the first Arkansas vascular plant flora with county-level dot maps for each species. He essentially based the pteridophyte treatment on Taylor (1976), but he only listed 70 species with 1288 county records. The work of Key (1975) on the pteridophytes of the Interior Highlands should also be mentioned as it described many of the pteridophytes occurring in Arkansas, but it lacked keys and dot maps essential to evaluate the likelihood of species in southern Missouri that might yet be found in the northern part of Arkansas.

While Taylor worked to publish a technical account from his dissertation, additional species new to Arkansas were discovered and reported. William Buck (1977) separated a northern variation

of *Selaginella apoda* based on different spore morphology and leaf form, and elevated it to species rank, naming it the Eclipsed Spikemoss, *S. eclipes*, and reported that it occurred in Arkansas. R. Dale Thomas (1978) reported three species that frequented rural cemetaries as being new to Arkansas: *Botrychium lunarioides*, *Ophioglossum nudicaule,* and *O. petiolatum.* W. C. Taylor and D. Johnson (1979) reported two species as new to Arkansas: *Thelypteris normalis* and *Thelypteris torressiana.* Johnson also located one plant of *Asplenium ×ebenoides* in Pope Co. in 1979. Two very old specimens of *Cheilanthes eatonii* from localities in northern Arkansas were discovered in herbaria collections, adding this species to the flora. These additions were added to the published version of Taylor's doctoral dissertation (Taylor & Demaree 1979). This modern account reported 78 taxa, supported by specimen vouchers (collector name, number, and herbarium of deposit) for 1335 county records mapped as county dots on species maps, adding eight species to the state flora, bringing the known and vouchered pteridophyte flora to 74 (Table 9).

Table 9. Eight ferns and fern allies were added to the Arkansas pteridophyte flora as summarized in Taylor and Demaree (1979).

Taylor's Names	Modern Names	First Report
67. Asplenium ×ebenoides	Asplenium ×ebenoides	Taylor & Demaree (1979)
68. Botrychium lunarioides	Botrychium lunarioides	Thomas (1978)
69. Cheilanthes eatonii	Cheilanthes eatonii	Taylor & Demaree (1979)
70. Ophioglossum nudicaule	Ophioglossum nudicaule	Thomas (1978)
71. Ophioglossum petiolatum	Ophioglossum petiolatum	Thomas (1978)
72. Selaginella eclipes	Selaginella eclipes	Buck (1977)
73. Thelypteris torressiana	Macrothelypteris toressiana	Taylor & Johnson (1979)
74. Thelypteris normalis	Thelypteris kunthii	Taylor & Johnson (1979)

After the dot maps of Taylor and Demaree (1979) were published, another fern new to the state (*Asplenium ×gravesii*) was located at Hot Springs, Garland Co. (Werth & Taylor 1980). J.H. Peck collected the horsetail *Equisetum laevigatum* in Crawford Co. as new to the state in 1981. Charles Meyer discovered *Lygodium japonicum* in Ashley Co. as a roadside weed in pine plantings in 1981. Jewel Moore (1982) prepared an identification manual to Arkansas pteridophytes for her students to use based on xerographic silhouettes. Summarizing all of this activity, Taylor (1984) provided a book-length manual with illustrations, descriptions, keys, voucher citations, and species dot maps for 81 pteridophytes (72 species, 5 hybrids, and 4 varieties) in 31 genera with 1356 county records. The fine line drawings by Paul W. Nelson inspired many to seek and identify ferns for the first time. This manual stimulated a resurgence of activity to locate and document Arkansas ferns. The Arkansas pteridophyte flora now contained 76 known and vouchered taxa (Table 10).

Table 10. Three additions to the Arkansas pteridophyte flora as presented in Taylor (1984).

Taylor's Names	Modern Names	First Report
75. Asplenium ×gravesii	Asplenium ×gravesii	Werth and Taylor (1980)
76. Equisetum laevigatum	Equisetum laevigatum	Taylor (1984)
77. Lygodium japonicum	Lygodium japonicum	Taylor (1984)

In the 1980s, Arkansas also underwent a resurgence in field botany activity to document its biodiversity. The result was an extraordinary burst in floristic activity on pteridophytes, which some had thought to be a settled issue. In 1981, Arkansas acquired its first resident pteridologist (J.H. Peck at University of Arkansas at Little Rock). He initiated a 30-year survey of fern abundance and distribution within Arkansas. Staff and contract botanists working for the Natural Heritage Commission, Ouachita National Forest, and Arkansas Field Office of The Nature Conservancy were directed to evaluated known old populations and to locate new populations and county or state records.

Pteridologists from out of state utilized Arkansas sample material to resolve phylogenetic and genetic problems. Using protein electrophoresis, Werth studied population variability of *Dryopteris* species and hybrids (Werth 1991) such as *D. carthusiana, D. marginalis,* and *D. celsa.* Werth, Evans, and Ware (1988) contrasted phenomena in the eastern USA with the situation in Arkansas in regard to *Dryopteris ×australis, D. celsa, and D. ludoviciana.* Li and Haufler (1984) studied isozyme diversity of the three species in *Osmunda* using Arkansas material compared to populations in the southern Appalachians and from more northerly locations. Our species differed less than plants that had migrated northward in the last 10,000 years. The results suggested that the basal species in the group was the cinnamon fern.

As a consequence of the activities by academics and contract botanists, one scouringrush (reported in Taylor 1984), two wood ferns, and seven clubmosses were added to the state flora (Orzell & Peck 1985; Peck et al. 1985a, 1985b, 1987; Peck & Peck 1988a, 1988b). Additionally, many studies were initiated to study the rare plants of Arkansas, including pteridophytes. Dan Marsh at Henderson State University and his students commenced studies on the abundance and distribution of Coastal Plain species of *Lycopodiella, Botrychium,* and *Ophioglossum.* Studies such as these led to additional reports on pteridophytes (Bates & Pittman 1993; Bray & Marsh 1993; Culwell 1994, Farrar 1985, 1990, 1992; Orzell & Bridges 1987; Peck 1985a, 1985b, 1986a, 1986b; Peck & Peck 1987, 1988b; Sundell 1986).

Summary documents were developed to compile, collate, and summarize these changes, updates, and numerous county records (Peck & Peck 1986, 1988a, 1988b; Peck et al. 1987a, 1987b). Peck and Peck (1986) added 297 county records to the distributions of 43 taxa. Nine species were added to the state flora for a total of 86 pteridophytes known and vouchered for Arkansas (Table 11).

Table 11. Nine additions to the Arkansas pteridophyte flora after Taylor (1984) as summarized by Peck and Peck (1986), Peck et al. (1987), and Peck and Peck (1988).

Reported Name	Modern Name	First Report
78. Lycopodium digitatum	Diphasiastrum digitatum	Peck & Peck (1988)
79. Dryopteris ludoviciana	Dryopteris ludoviciana	Peck et al. (1985b)
80. Dryopteris ×australis	Dryopteris ×australis	Orzell & Peck (1985)
81. Lycopodium alopecuroides	Lycopodiella alopecuroides	Peck & Peck (1986)
82. Lycopodium prostrata	Lycopodiella prostrata	Peck & Peck (1986)
83. Lycopodium ×bruceii	Lycopodiella ×bruceii	Peck & Peck (1986)
84. Lycopodium ×copelandii	Lycopodiella ×copelandii	Peck & Peck (1986)
85. L. alopecuroides × prostrata	L. alopecuroides × prostrata	Peck & Peck (1986)
86. Lycopodium caroliniana	Pseudolycopodiella caroliniana	Peck & Peck (1986)

To produce a second edition of his checklist and atlas of Arkansas vascular plants, Smith (1988) used Taylor (1984) and reports by Peck and other workers (see Table 11) to update and report a state pterdiophyte flora of 78 species and to provide dot maps with 1622 county records. No new taxa were added to the known list of Arkansas pteridophytes.

The pteridophyte floristic effort started in the 1980s continued apace in the 1990s. Field work yielded additional species new to Arkansas. Reports added a quillwort (Brown & Thomas 1992), a whiskfern (Bray et al., 1994; Peck et al. 1995; Thomas et al. 1999) and many county records. Material of *Woodsia scopulina* from Magazine Mountain was used in an electron microscope study to demonstrate the presence of vessels in that species, a condition that is thought to be rare in ferns (Schneider & Carlquist 1988).

Other national efforts to conduct systematic studies on problematic fern genera of North America led to revisions that affected the correct names of ferns in Arkansas. Revisions to the genus *Cystopteris* (Haufler & Windham 1991; Haufler et al. 1985; Haufler, et al. 1990) added three taxa to the Arkansas flora. Revision of the genus *Marsilea* (Johnson 1986, 1988) subsumed two historical species or varieties (*M. mucronata* and M. *uncinata*) into one encompassing species, *Marsilea vestita.* A revision of *Polypodium* (Haufler & Windham 1991) changed the generic name of one species in the Arkansas flora. The revision of genus *Woodsia* (Windham 1993) added a second variety to the typical *Woodsia obtusa.* These were brought together in 1993 with Volume 2 of Flora North America, which provided keys and detailed descriptions of all pteridophytes north of Mexico. Changes in generic nonmenclature significantly affected six genera in Arkansas: *Lycopodium, Athyrium, Lorinseria, Notholeana, Polypodium,* and *Thelypteris*. Other changes affected varieties or forms in *Asplenium, Marsilea, Thelypteris,* and *Woodsia.* Smith (1994) used this source to update the nomenclature in his keys to the vascular flora of Arkansas.

Four taxa were added to the Arkansas pteridophyte flora from generic revisions and two taxa were added from field collecting. Peck and Taylor reported these six additions in a new summary checklist of 92 pteridophytes provided with county dot maps with 2224 county records (Table 12).

Table 12. Four species and two hybrids native to the Arkansas were added to its pteridophyte flora as summarized in Peck and Taylor (1995).

Reported Name	Modern Name	First Report
87. Cystopteris tenuis	Cystopteris tenuis	Peck & Taylor (1995)
88. Cystopteris bulbifera × tennesseensis	C. bulbifera × tennesseensis	Peck & Taylor (1995)
89. Cystopteris protrusa × tennesseensis	C. protrusa × tennesseensis	Peck & Taylor (1995)
90. Isoetes engelmannii	I. engelmannii	Brown & Thomas (1992)
91. Psilotum nudum	Psilotum nudum	Bray et al. (1994)
92. Woodsia obtusa occidentalis	W. obtusa occidentalis	Windham (1993)

Over the last 15 years (1996–2011), field work has focused on species often overlooked or misidentified in herbaria as they were generally undercollected or poorly separated within herbaria. Special efforts were made for species that were known from adjacent states but not yet know in Arkansas. Species with very specific microhabitats within wetlands, cliff faces or sheltered rock houses, and disturbed barrow pits were studied intensively. Additionally, an emphasis was placed on documenting the naturalization potential of ferns cultivated in Arkansas, leading to the discovery of

many such escapes not previously suspected or documented. Special efforts were made to inspect parklands in the greater Little Rock vicinity and at Hot Springs in and around the grounds of Garvan Woodland Garden (Crank & Peck 2011).

Since 1995, 12 fern taxa (Table 13) have been added to the Arkansas flora as new and native (Peck 2011). The species new to Arkansas include a clubmoss (Bray 1996), a log fern species and hybrid (Peck, Witsell, and Hendrix 1999; Peck 2000), an aquatic mosquito fern (Peck 2003), and four spleenworts, a second pepperwort, and a second lady fern (Peck 2011). Of the reported Arkansas native ferns, one was deleted (*Azolla caroliniana*), being treated as a synonym of *Azolla mexicana* and now correctly known as *Azolla microphylla*. The separation of Arkansas *Azolla* material into two kinds of mosquito ferns was mainly the result of mis-interpreting smaller plants found floating and shaded that differed with larger plants found stranded on mudflats, in full sun, and with higher levels of nutrients in sediments than in open water. Thus differential growth altered one kind into two kinds. Two hybrids (*Huperzia ×bartleyi* and *Dryopteris ×neowherryi*) were erroneously attributed to the Arkansas flora and were excluded (Peck 2003).

Table 13. Eight species and two hybrids native and new to the pteridophyte flora of Arkansas were added after Peck and Taylor (1995) and summarized in Peck (2011).

Reported Name	Modern Name	First Report
93. Asplenium montanum	Asplenium montanum	Peck (2011)
94. Asplenium ruta-muraria	Asplenium ruta-muraria	Peck (2011)
95. Asplenium septentrianale	Asplenium septentrianale	Peck (2011)
96. Asplenium ×trudellii	Asplenium ×trudellii	Peck (2011)
97. Athyrium angustum	Athyrium angustum	Peck (2011)
98. Dryopteris goldiana	Dryopteris goldiana	Peck et al. (1999)
99. Dryopteris celsa × goldiana	D. celsa × goldiana	Peck et al. (1999)
100. Marsilea macropoda	Marsilea macropoda	Peck (2011)
101. Palhinhaea cernua	Palhinhaea cernua	Bray (1996)
102. Trichomanes intricatum	Trichomanes intricatum	Peck (2011)
Azolla caroliniana	Azolla microphylla	Peck (2003); subsumed
Dryopteris ×neowherryi	Dryopteris ×neowherryi	Peck (2003); misidentified
Huperzia ×bartleyi	Huperzia ×bartleyi	Peck (2003); misidentified

Since 1995, 20 fern taxa (Table 14) have been added as new and naturalized to the Arkansas fern flora (Peck 2011). These reports include two species of water spangles (Peck 1999, 2000; Peck & Serviss 2006), a Yankee Fern (Peck 2002), one log fern and one waterclover fern (Simpson, Crank, Witsell, and Peck 2008), two holly ferns (Peck 2003), an East Indian Holly Fern, Japanese Painted Lady Fern, a bramble fern, a rock fern, a third water clover, a second beech fern, and six spikemosses (Table 14). Two species (*Matteuccia struthiopteris* and *Thelypteris kunthii*) are native to the USA but not native in Arkansas, but as they were extensively cultivated around homesteads, they have spread, escaped, and naturalized into and across Arkansas (Peck 2011). Of the reported Arkansas naturalized ferns, one was deleted (*C. fortunei*), being without a known voucher (Peck 2011). By the end of that year, two populations were located in Chicot and Desha counties, so that *Cyrtomium fortunei* was reinstated into the Arkansas fern flora with this report. Another non-native fern cultivated in Arkansas has recently escaped and naturalized: *Polystichum setiferum* is now reported as an addition to the Arkansas fern flora with this report.

Table 14. Twenty-one naturalized species were added as new to the pteridophyte flora of Arkansas after Peck and Taylor (1995) and summarized in Peck (2011), plus two new additions based on the present report.

Reported Name	Modern Name	First Report
103. Arachniodes simplicior	Arachniodes simplicior	Peck (2011)
104. Athyrium niponicum'Pictum'	Athyrium niponicum 'Pictum'	Peck (2011)
105. Cyrtomium falcatum	Cyrtomium falcatum	Peck (2003)
106. Dryopteris erythrospora	Dryopteris erythrospora	Simpson et al. (2006)
107. Hypolepis tenuifolia	Hypolepis tenuifolia	Peck (2011)
108. Marsilea mutica	Marsilea mutica	Peck (2011)
109. Marsilea quadrifolia	Marsilea quadrifolia	Simpson et al. (2006)
110. Matteuccia struthiopteris	Mattueccia struthiopteris	Peck (2011)
111. Nephrolepis exaltata	Nephrolepis exaltata	Peck (2002)
112. Polystichum tsus-sinense	Polystichum tsus-simense	Peck (2011)
113. Phegopteris decursive-pinnata	P. decursive-pinnata	Peck (2011)
114. Salvinia minima	Salvinia minima	Peck (1999, 2000)
115. Salvinia molesta	Salvinia molesta	Peck (2011)
116. Selaginella braunii	Selaginella braunii	Peck (2011)
117. Selaginella kraussiana	Selaginella kraussiana	Peck (2011)
118. S. k. 'Aurea'	S. k. 'Aurea'	Peck (2011)
119. S. k. 'Brownii'	S. k. 'Brownii'	Peck (2011)
120. S. k. 'Goldtips'	S. k. 'Goldtips'	Peck (2011)
121. Selaginella uncinata	Selaginella uncinata	Peck (2011)
122. Cyrtomium fortunei	Cyrtomium fortunei	Peck (present report)
123. Polystichum setiferum	Polystichum setiferum	Peck (present report)

Recent New and Noteworthy Collections

Falcate Holly Fern – **Cyrtomium falcatum** (L.f.) C. Presl var. **falcatum** (Dryopteridaceae)—This native of Japan has continued to be widely planted in southern Arkansas as it is quite drought resistant (Hoshizaki & Moran 2001; Mickel 2003; Olsen 2007) . Peck (2011) reported 3 counties vouchered with naturalized specimens. Nine more counties are reported here.

Voucher specimens: **ARKANSAS: Calhoun Co.**: *Peck 2010474* (BRIT). **Clark Co.**: *Peck 2011069* (BRIT). **Columbia Co.**: *Peck 2010095* (BRIT). **Hempstead Co.**: *Peck 2010565* (BRIT). **Lafayette Co.**: *Peck 2011081* (BRIT). **Miller Co.**: *Peck 2011132* (BRIT). **Nevada Co.**: *Peck 2010523* (BRIT). **Ouachita Co.**: *Peck 2011060* (BRIT). **Union Co.**: *Peck 2003132* (BRIT).

Fortune's Holly Fern – **Cyrtomium fortunei** J. Smith var. **fortunei** (Dryopteridaceae)—This species was provisionally listed for Arkansas by Peck (2003) but delisted in Peck (2011) as vouchers had not been deposited or no longer could be found. Recent field work has located plants in Chicot and Desha counties in lowland woods on the Mississippi River side of the batture revetment dikes. These plants were quite mature with more than a dozen fronds each in lowland oak woods not in proximity to human habitation. Peck (2011) concluded that they might be ancient escapes from plantations that may no longer be in evidence (Hoshizaki & Moran 2001; Mickel 2003; Olsen 2007). With these vouchered collections, the species is reinstated to the list of Arkansas pteridophytes.

Voucher specimens: **ARKANSAS: Chicot Co.**: *Peck 2011443* (BRIT). **Desha Co.**: *Peck 2011366* (BRIT).

Autumn Fern – **Dryopteris erythrosora** (Eaton) Kuntze (Dryopteridaceae)—This fern from Japan is commonly planted in southern Arkansas (Hoshizaki & Moran 2001; Mickel 2003; Olsen, 2007). There are many cutivars (Hoshizaki & Wilson 1999), but Arkansas material does not seem to be very divergent from the normal type. To the 7 counties noted in Peck (2011), 14 more counties are reported.

Voucher specimens: **ARKANSAS: Ashley Co.**: *Peck 2011087* (BRIT). **Bradley Co.**: *Peck 2011136* (BRIT). **Calhoun Co.**: *Peck 2010473* (BRIT). **Chicot Co.**: *Peck 2011096* (BRIT). **Clark Co.**: *Peck 2011070* (BRIT). **Cleveland Co.**: *Peck 2011122* (BRIT). **Dallas Co.**: *Peck 2011067* (BRIT). **Desha Co.**: *Peck 2011193* (BRIT). **Hempstead Co.**: *Peck 2010563* (BRIT). **Lincoln Co.**: *Peck 2011072* (BRIT). **Nevada Co.**: *Peck 2010521* (BRIT). **Lafayette** Co.: *Peck 2011081* (BRIT). **Miller Co.**: *Peck 2011022* (BRIT).

Soft Shield Fern – **Polystichum setiferum** (Forsskål) T. Moore ex Woynar (Dryopteridaceae)—This fern native to Great Britain has a long history under cultivation and hundreds of reported cultivars (Dyce 2005), some of which need to be touched to believed as they appear almost artificial in aspect. The plants in our area in the hardy fern trade are erroneously offered under the common name "Alaska Fern" but that name applies to *Polystichum setigerum* (Hoshizaki & Moran 2001; Mickel 2003; Olsen 2007). Using Dyce's cultivar naming system, our material ranges from 'Diversilobum' to 'Plumosum'. Plants occur in lowland woods with moist soils. At the base of stipes of mature plants, vegetatively produced bulbets are evident that might afford some level of vegetative expansion. Plants growing without human care were found in 4 counties in Arkansas.

Voucher specimens: **ARKANSAS: Garland Co.**: *Peck 2011160* (BRIT). **Ouachita Co.**: *Peck 2011205* (BRIT). **Pulaski Co.**: *Peck 2010050* (BRIT). **Union Co.**: *Peck 2003140* (BRIT).

Korean Rock Fern – **Polystichum tsus-simense** (Hooker) J. Smith (Dryopteridaceae—This fern native to Korea was reported for Arkansas for the first time by Peck (2011). It is relatively small compared to other species cultivated in this genus (Hoshizaki & Moran 2001; Mickel 2003; Olsen 2007). Two additional counties are added with this report.

Voucher specimens: **ARKANSAS: Pulaski Co.**: *Peck 2011361* (BRIT). **Union Co.**: *Amason s.n.* (BRIT).

Kunth's Fern – **Thelypteris kunthii** (Desv.) Morton (Thelypteridaceae)—This fern is considered native to the southeastern USA and is commonly planted around houses in the southern half of the state, as it is quite drought resistant (Hoshizaki & Moran 2001; Mickel 2003; Olsen 2007). It is arguable whether the species is native to the state or whether its present distribution is mainly the result of escapes from cultivated plants. It was first noticed as naturalized in Arkansas in Ashley County in the late 1970s. Surely it would have been noticed there or elsewhere in the state earlier than that if it had been native or strongly native. I consider this species to be native to North America but mainly cultivated, escaping, and naturalized in Arkansas. However, there are populations that may have arrived on their own in Arkansas from Louisiana. It may be that its current spread into Arkansas is an admixture of native and naturalized populations. Therefore, I list it here as "native (in part)." With the update records in Peck (2011), 26 county vouchers were then known and reported for this fern in Arkansas. To that we add 10 more county records for a total of 36.

Voucher specimens: **ARKANSAS: Arkansas Co.**: *Peck 2011175* (BRIT). **Desha Co.**: *Peck 2011165* (BRIT). **Hempstead Co.**: *Peck 2010570* (BRIT). **Howard Co.**: *Peck 2010125* (BRIT). **Lincoln Co.**: *Peck 2011157* (BRIT). **Montgomery Co.**: *Peck 2011137* (BRIT). **Phillips Co.**: *Peck 2010115* (BRIT). **Pike Co.**: *Peck 2010100* (BRIT). **Polk Co.**: *Peck 2010120* (BRIT). **Sevier Co.**: *Peck 2010110* (BRIT).

Annotated Checklist of Ferns in Arkansas

The Arkansas fern flora now totals 123 taxa (Table 15) in 44 genera and 22 families, documented and vouchered with 3049 county-level occurrence records. The Arkansas fern flora checklist (Table 15) is arranged in alphabetic order by genus and annotated (1) as to native or naturalized and (2) as to the number of counties from which they have been vouchered in Arkansas. There are now 98 native kinds composed of 84 species, 13 hybrids, two species with two subspecies each and one species with two forms. There are now 25 naturalized kinds composed of 22 species with one species with the typical plus three cultivars.

Table 15. The checklist of Arkansas ferns and fern allies annotated with comments on whether they are native or naturalized in Arkansas and the number of counties from which they are known and vouchered.

ADIANTACEAE	**Status, # cos.**
Adiantum capillus-veneris L.	Native, 29
Adiantum pedatum L. subsp. *pedatum*	Native, 54
Argyrochosma dealbata (Pursh) Windham	Native, 8
Cheilanthes alabamensis (Buckley) Kunze	Native, 14
Cheilanthes eatonii Baker	Native, 2; extirpated
[C. castanea Maxon]	
Cheilanthes feei T. Moore	Native, 17
Cheilanthes lanosa (Michx.) D.C. Eaton	Native, 40
Cheilanthes tomentosa Link	Native, 37
Pellaea atropurpurea (L.) Link	Native, 41
Pellaea glabella Mett. ex Kuhn subsp. *glabella*	Native 39
ASPLENIACEAE	
Asplenium bradleyi D.C. Eaton	Native, 39
Asplenium montanum Willd.	Native, 1
Asplenium pinnatifidum Nutt.	Native, 23
Asplenium platyneuron (L.) Britton, Sterns & Poggenb.	Native, 75
Asplenium resiliens Kunze	Native, 27
Asplenium rhizophyllum L.	Native, 33
[Camptosorus rhizophyllus (L.) Link]	
Asplenium ruta-muraria L.	Native, 1
Asplenium septentrionale (L.) Hoffm.	Native, 1
Asplenium trichomanes L. subsp. trichomanes	Native, 39
Asplenium ×*ebenoides* R.R. Scott (pro. sp.)	Native, 5
[A. platyneuron × rhizophyllum]	
[×Asplenosorus ebenoides Wherry]	
Asplenium ×*gravesii* Maxon [A. bradleyi × pinnatifidum]	Native, 3
[×Asplenosorus gravesii Mickel]	
Asplenium ×*kentuckiensis* McCoy	
[A. pinnatifidum × platyneuron]	Native, 1; extirpated
[×Asplenosorus kentuckiensis Mickel]	

Asplenium ×trudellii Wherry [A. montanum × pinnatifidum] [×Asplenosorus trudellii Mickel]	Native, 1
AZOLLACEAE	
Azolla microphylla Kaulf. [A. caroliniana Willd., A. mexicana C. Presl, A. mexicana Cham. & Schltdl.]	Native, 60
BLECHNACEAE	
Woodwardia areolata (L.) T. Moore [Lorinseria areolata (L.) C. Presl]	Native, 74
Woodwardia virginica (L.) Sm.	Native, 34
DAVALLIACEAE	
Nephrolepis exaltata (L.) Schott	Naturalized, 1
DENNSTAEDTIACEAE	
Hypolepis tenuifolia (G. Forster) Bernhard.	Naturalized, 3
Dennstaedtia punctilobula (Michx.) T. Moore	Native, 4
Pteridium aquilinum (L.) Kuhn subsp. *latiusculum* (Desv.) Hulten [Pteridium aquilinum (L.) Kuhn var. latiusculum (Desv.) Underw. ex A. Heller]	Native, 75
Pteridium aquilinum (L.) Kuhn subsp. *pseudocaudatum* (Clute) Hulten [Pteridium aquilinum (L.) Kuhn var. pseudocaudatum (Clute) A. Heller]	Native, 75
DRYOPTERACEAE	
Arachniodes simplicior (Makino) Ohwi	Naturalized, 2
Cyrtomium falcatum (L.f.) C. Presl	Naturalized, 12
Cyrtomium fortunei J. Smith	Naturalized, 2
Dryopteris carthusiana (Vill.) H.P. Fuchs	Native, 3
Dryopteris celsa (W. Palmer) Knowlt., Palmer & Pollard	Native, 6
Dryopteris erythrosora (D.C. Eaton) O. Kunze	Naturalized, 16
Dryopteris goldiana (Hook.) ex Goldie) A. Gray	Native, 4
Dryopteris ludoviciana (Kunze) Small	Native, 3
Dryopteris marginalis (L.) A. Gray	Native, 38
Dryopteris ×australis (Wherry) Small [D. goldiana × ludoviciana]	Native, 4
Dryopteris ×leedsii Wherry [D. celsa × marginalis]	Native, 2
Dryopteris celsa × goldiana	Native, 1
Polystichum acrostichoides (Michx.) Schott	Native, 75
Polystichum setiferum (C. Presl) C. Presl	Naturalized, 3
Polystichum tsus-simense (J. Hooker) J. Smith var. *mayebarae* (Tagawa) Sa. Kurata	Naturalized, 3
EQUISETACEAE	
Equisetum arvense L.	Native, 13
Equisetum hyemale L. subsp. *affine* (Engelm.) Calder & Roy L. Taylor [Equisetum hyemale L. var. affine (Engelm.) A.A. Eaton]	Native, 75
Equisetum laevigatum A. Braun	Native, 7
Equisetum ×ferrissii Clute [E. arvense × hyemale subsp. affine]	Native, 75

HYMENOPHYLLACEAE	
Trichomanes boschianum J.W. Sturm ex Bosch	Native, 5
Trichomanes intricatum Farrar	Native, 2
Trichomanes petersii A. Gray	Native, 13
ISOETACEAE	
Isoetes butleri Engelm.	Native, 41
Isoetes engelmannii A. Braun	Native, 3
Isoetes melanopoda J. Gay & Durieu	Native, 64
[I. melanopoda J. Gay & Durieu f. pallida (Engelm.) Fernald]	
LYCOPODIACEAE	
Diphasiastrum digitatum (Dill.) Holub	Native, 9
[Lycopodium digitatum Dill.]	
Huperzia lucidula (Michx.) Trevis.	Native, 6
[Lycopodium lucidulum Michx.]	
Lycopodiella alopecuroides (L.) Cranfill	Native, 15
[Lycopodium alopecuroides L.]	
Lycopodiella appressa (Chapm.) Cranfill	Native, 21
[Lycopodium appressum (Chapm.) F.E. Lloyd & Underw.]	
Lycopodiella prostrata (R.M. Harper) Cranfill	Native, 8
[Lycopodium prostratum R. M. Harper]	
Lycopodiella ×*bruceii* Cranfill [L. appressa × prostrata]	Native, 8
Lycopodiella ×*copelandii* (Eiger) Cranfill [L. alopecuroides × appressa]	Native, 8
[Lycopodium ×copelandii Eiger]	
Lycopodiella alopecuroides × *prostrata*	Native, 3
Palhinhaea cernua (L.) Franco & Vasc.	Native, 1
[Lycopodiella cernua (L.) Pic. Serm.]	
Pseudolycopodiella caroliniana (L.) Holub	Native, 9
[Lycopodiella caroliniana (L.) Pic. Serm.]	
MARSILEACEAE	
Marsilea macropoda Engelm. ex A. Braun	Native, 2
Marsilea mutica Mett.	Naturalized, 2
Marsilea quadrifolia L.	Naturalized, 2
Marsilea vestita Hook. & Grev.	Native, 18
[M. mucronata A. Braun, Marsilea uncinata A. Braun]	
Pilularia americana A. Braun	Native, 14
OPHIOGLOSSACEAE	
Botrychium biternatum (Savigny) Underw.	Native, 75
[Sceptridium biternatum (Savigny) Lyon]	
Botrychium dissectum Spreng. f. *dissectum*	Native, 33
[Sceptridium dissectum (Spreng.) Lyon]	
Botrychium dissectum Spreng. f. *obliquum* (Muhl.) Fernald	Native, 75
Botrychium lunarioides (Michx.) Sw.	Native, 24
[Sceptridium lunarioides (Michx.) Holub]	
Botrychium virginianum (L.) Sw.	Native, 75
[Sceptridium virginianus (L.) Holub]	
Ophioglossum crotalophoroides Walter	Native, 48
Ophioglossum engelmannii Prantl	Native, 33

Ophioglossum nudicaule L.f.	Native, 22
Ophioglossum petiolatum Hooker	Naturalized, 55
Ophioglossum pycnostichum (Fernald) A. Löve & D. Löve [O. vulgatum L. var. pycnostichum Fernald]	Native, 42
OSMUNDACEAE	
Osmunda claytoniana L.	Native, 2
Osmunda regalis L. var. *spectabilis* (Willd.) A. Gray	Native, 75
Osmundastrum cinnamomeum (L.) C. Presl	Native, 75
POLYPODIACEAE	
Pleopeltis polypodioides (L.) E.G. Andrews & Windham subsp. *michauxiana* (Weath.) E.G. Andrews & Windham [Polypodium polypodioides L. var. michauxianum Weath.]	Native, 75
Polypodium virginianum L.	Native, 22
PSILOTACEAE	
Psilotum nudum (L.) P. Beauv.	Native (in part), 13
PTERIDACEAE	
Pteris multifida Poir.	Naturalized, 3
SALVINIACEAE	
Salvinia minima Baker	Naturalized, 11
Salvinia molesta D.S. Mitchell	Naturalized, 2
SCHIZAEACEAE	
Lygodium japonicum (Thunb.) Sw.	Naturalized, 25
SELAGINELLACEAE	
Selaginella apoda (L.) Spring	Native, 56
Selaginella braunii Baker	Naturalized, 2
Selaginella coralline (Riddell) Wilbur & M.K. Whitson [S. riddellii Van Eselt, Lycopodium corallinum Riddell]	Native, 12
Selaginella eclipes W.R. Buck [S. apoda (L.) Spring subsp. eclipes (W.R. Buck) Skoda]	Native, 35
Selaginella kraussiana (Kunze) A. Braun	Naturalized, 2
Selaginella kraussiana (Kunze) A. Braun 'Aurea'	Naturalized, 2
Selaginella kraussiana (Kunze) A. Braun 'Brownii'	Naturalized, 2
Selaginella kraussiana (Kunze) A. Braun 'Goldtips'	Naturalized, 2
Selaginella rupestris (L.) Spring	Native, 18
Selaginella uncinata (Desv. ex Poir.) Spring	Naturalized,2
THELYPTERIDACEAE	
Macrothelypteris torresiana (Gaudich.) Ching [Thelypteris torresiana (Gaudich.) Alston]	Naturalized, 32
Parathelypteris noveboracensis (L.) Ching [Thelypteris noveboracensis (L.) Nieuwl.]	Native, 12
Phegopteris decursive-pinnata (H.C. Hall) Fee	Naturalized, 1
Phegopteris hexagonoptera (Michx.) Fee	Native, 75
Thelypteris kunthii (Desv.) C.V. Morton	Native (in part), 36

[T. normalis (C. Chr.) Moxley]	
Thelypteris palustris (A. Gray) Schott	
var. *pubescens* (G. Lawson) Fernald	Native, 36
[T. palustris (A. Gray) Schott var. haleana Fernald]	
WOODSIACEAE	
Athyrium angustum (Willd.) C. Presl	Native, 27
[A. filix-femina (L.) Roth var. angustum (Willd.) G. Lawson, A. filix-femina (L.) Roth subsp. angustum R.T. Clausen]	
Athyrium asplenioides (Michx.) A.A. Eaton	Native, 75
[A. filix-femina (L.) Roth var. asplenioides (Michx.) Farw., A. filix-femina (L.) Roth subsp. asplenioides Hulten]	
Athyrium niponicum (Mett.) Hance 'Pictum'	Naturalized, 2
Cystopteris bulbifera (L.) Bernh.	Native, 34
Cystopteris protrusa (Weath.) Blasdell	Native, 49
Cystopteris tennesseensis Shaver	Native, 35
Cystopteris tenuis (Michx.) Desv.	Native, 24
[C. fragilis (L.) Bernh. var. mackayii G. Lawson]	
Cystopteris bulbifera × *tennesseensis*	Native, 3
Cystopteris protrusa × *tennesseensis*	Native, 1
Deparia acrostichoides (Sw.) M. Kato	Native, 12
[Athyrium acrostichoides (Sw.) Diels]	
Diplazium pycnocarpon (Spreng.) M. Broun	Native, 22
[Athyrium pycnocarpon Tidestr.]	
Matteuccia struthiopteris (L.) Tod.	
var. *pensylvanica* (Willd.) C.V. Morton	Naturalized, 23
[US native, but widely planted in northern Arkansas]	
Onoclea sensibilis L.	Native, 75
Woodsia obtusa (Spreng.) Torr. subsp. *obtusa*	Native, 75
Woodsia obtusa (Spreng.) Torr. subsp. *occidentalis* Windham	Native, 43
Woodsia scopulina D.C. Eaton	
subsp. *appalachiana* (T.M.C. Taylor) Windham	Native, 3
[W. appalachiana T.M.C. Taylor]	

Floristic Analysis of Arkansas Pteridophytes

This report is the 15th Arkansas pteridophyte flora (Table 15). Currently, there are 123 kinds of ferns known from Arkansas, including 103 species in 47 genera in 22 families. The 123 kinds include 98 native and 25 naturalized. The 103 species include 83 that are native and 20 that are naturalized. The 103 species are classified in 41 genera and 19 families. To the 83 native species are added 13 hybrids plus two species that are present with two subspecies and one species with two forms to total 98 kinds. To the 20 non-native species are added one species with 3 cultivars growing in the state to total 25 naturalied kinds. With 98 native species known from Arkansas, nearly 20% of the 441 native pteridophytes found in North America north of Mexico occur in Arkansas.

Table 15. Chronology of Arkansas Pteridophyte Floras compared to the present flora.

#	Author	Year	# Taxa	% Present Flora
1.	Nuttall	1835	21	17
2.	Lesquereux	1860	29	24
3.	Harvey	1881	40	33
4.	Branner & Coville	1891	44	36
5.	Buchholz & Palmer	1926	49	40
6.	Moore	1940	55	45
7.	Demaree	1943	56	46
8.	Taylor	1976	65	53
9.	Smith	1978	68	55
10.	Taylor & Demaree	1979	73	60
11.	Taylor	1984	76	62
12.	Peck, Peck, & Taylor	1987	85	70
13.	Smith	1988	86	70
14.	Peck & Taylor	1995	92	75
15.	Peck (this report)	2011	123	100

taxa reported now part of present flora; more were reported, but either lack vouchers, were misidentified, or taxon now lacks present standing.

The fern flora is documented with 3053 county records. There are a mean number of 24.7 county records per taxon (123 kinds) and a mean number of 40.6 taxa (kinds) per county (75 counties) (Table 16). The gradual progression of increases with each subsequent flora shows the magnitude of effort required to produce a flora, even granted that each flora incorporates the sum of all past efforts. The increases in the last 30 years show a focus on rare plant occurrences (Table 15) and an ever expanding number of exotic fern species escaping into the Arkansas landscape (Table 16).

Table 16. Comparison of Arkansas pteridophyte floras reporting county records, showing a gain of 27 taxa and 1275 county-occurrence records since Smith's (1978) atlas of the state vascular flora.

Author (year)	Taxa	Total county-records	mean records/taxon	mean records/co.
Taylor (1976)	65	1321	18.1	17.6
Smith (1978)	68	1288	18.4	17.2
Taylor & Demaree (1979)	74	1335	18.0	17.8
Taylor (1984)	77	1356	17.4	18.1
Smith (1988)	86	1622	18.8	21.6
Peck & Taylor (1995)	92	2224	24.2	29.7
Peck (this report)	123	3053	24.7	40.6

Species Analysis

Sixteen pteridophytes have state-wide distributions and were collected in each of the 75 counties of Arkansas (Table 17). *Pleopeltis polypodioides* might be the most ubiquitous (widespread) Arkansas pteridophyte species. It occurs in all physiographic regions as an epiphyte on a number of tree species (especially open-grown oaks) and sometimes on rocks. *Asplenium platyneuron* and *Polystichum acrostichoides* usually occur on well drained sites and in relatively impermeable soils where few other ferns occur. Only *Woodsia obtusa* subsp. *obtusa* occurs in relatively dry situations, but it too can tolerate more moist sites if in the sun. Eight other species with a nearly state-wide distribution are known from 50 or more counties, including three species with more than 60 counties and four species with more than 50 counties. Again, these tend to be moisture-loving species, with the exceptions of the two subspecies of *Pteridium aquilinum*, which prefer loose soils and well drained locations.

Table 17. 22 state-wide or nearly ubiquitous pteridophytes are known from 50 or more counties of Arkansas.

TAXA NOW KNOWN STATEWIDE	Counties in 1984	Counties in 2011
Asplenium platyneuron	60	75
Athyrium asplenioides	71	75
Botrychium biternatum	38	75
Botrychium dissectum obliquum	7	75
Botrychium virginianum	46	75
Equisetum hyemale affine	30	75
Equisetum ×ferrissi	11	75
Onoclea sensibilis	42	75
Osmunda regalis spectabilis	42	75
Osmundastrum cinnamomea	42	75
Phegopteris hexagonoptera	44	75
Pleopeltis polypodioides	67	75
Polystichum acrostichoides	62	75
Pteridium aquilinum latiusculum	40	75
Pteridium aquilinum pseudocaudatum	41	75
Woodsia obtusa obtusa	53	75
Woodwardia areolata	34	74
Isoetes melanopoda	23	64
Azolla microphylla	12	60
Selaginella apoda	21	56
Ophioglossum petiolatum	4	55
Adiantum pedatum pedatum	40	54
TOTALS	794	1138
Added since 1984		+344

These 22 species (Table 17) are the most ubiquitous in Arkansas, but they are not uniform in abundance across the state. Some are more common in the Gulf Coastal Plain lowlands, such as *Azolla microphylla, Equisetum hyemale* var. *affine*, *Isoetes melanopoda*, *Ophioglossum petiolatum, Osmundastrum cinnamomea, O. regalis,* and *Pteridium aquilinum* subsp. *pseudocaudatum.* Others such as *Botrychium biternatum, Onoclea sensibilis, Phegopteris hexagonoptera, Selaginella apoda, Woodsia obtusa* subsp. *obtusa*, and *Woodwardia areolata* are more abundant across the entire southern part of the state, where they are often collected in the Ouachita Mountains and West Gulf Coastal Plain regions. In contrast, *Athyrium asplenioides, Botrychium dissectum* f. *obliquum,* and *Botrychium virginianum* are more abundant to the north and in the Interior Highland region.

Four other species, not so abundant or widely distributed, occur in both the Interior Highlands and Gulf Coastal Plain regions, spread in a more diffuse pattern. These include *Ophioglossum pycnostichum, Pteris multifida, Selaginella arenicola* subsp. *riddellii, Thelypteris palustris* var. *pubescens,* and *Woodwardia virginica. Ophioglossum pycnostichum* is a relatively cryptic species probably overlooked and more common than collected. *Pteris multifida* was established at both localities through some human assistance, so it shows no particular message with its pattern. The last three are far more frequent and abundant in Gulf Coastal Plain habitats but show up sparingly or disjunct in a few other regions in similar habitats or environments. These four species have a diffuse pattern with a few exceptional or anomalous localities, making them harder to classify.

Besides the 22 most ubiquitous species and 5 species of diffuse distribution, an additional 16 species of pteridophytes can be found in the lowlands of the Gulf Coastal Plain, including: *Botrychium lunarioides, Dryopteris ludoviciana, Lycopodiella alopecuroides, L. appressa, L. prostrata, L. ×bruceii, L. ×copelandii, L. alopecuroides × X prostrata, Macrothelypteris torressiana, Nephrolepis exaltata, Ophioglossum nudicaule, Palhinhaea cernua, Pseudolycopodiella caroliniana, Psilotum nudum, Salvinia minima, S. molesta,* and *Selaginella apoda.* Another five species occur in the Gulf Coastal Plain and occur in similar habitats found along the Arkansas River Valley region of the Interior Highlands, including *Azolla mexicana, Lygodium japonicum, Marsilea vestita, Ophioglossum crotalophoroides,* and *Thelypteris kunthii.* Altogether, 46 species can be found in the Gulf Coastal Plain of Arkansas.

In contrast, besides the ubiquitous and diffuse species, 43 species are seemingly restricted to the Interior Highlands occur in Arkansas. Species that appear to be restricted to the Interior Highlands of Arkansas include *Adiantum pedatum, Asplenium bradleyi, Asplenium trichomanes, Cheilanthes lanosa, Cheilanthes tomentosa, Dennstaedtia punctilobula, Dryopteris marginalis, Trichomanes intracatum, Trichomanes petersii,* and *Woodsia scopulina* var. *appalachiana.* These plants are all inhabitants of a variety of rock outcrops or rocky, wooded slopes. *Asplenium trichomanes* and *Dryopteris marginalis* are usually found in moist, shaded habitats, while *Cheilanthes tomentosa* occurs on dry, exposed sites. *Adiantum pedatum* occurs in moist, shaded, humus-rich soils, while *Asplenium bradleyi* and *Cheilanthes lanosa* are saxicolous or epipetric plants, usually associated with sandstone outcrops.

Some ferns appear to be restricted to the Ozark Mountains on calcareous rocks. They are most abundant mainly in the northern half of the Ozark Mountains and include *Asplenium resiliens, Cheilanthes alabamensis, C. eatonii, C. feei, C. tomentosa, Argyrochosma dealbata, Pellaea atropurpurea,* and *P. glabella.* Other ferns mostly restricted to the Ozark Mountains include *Asplenium rhizophyllum, Cystopteris tennesseensis, C. tenuis,* and *Diplazium pycnocarpon. Asplenium rhizophyllum, Cystopteris tennesseensis, and C. tenuis* occur on limestone, dolomite, and sandstone outcrops. *Diplazium pycnocarpon* inhabits rich woods, stream banks, and moist, shaded, rocky slopes in this region. *Trichomanes boschianum* is restricted to non-calcareous sandstones.

Some ferns appear to be restricted to the Ouachita Mountains. *Dryopteris celsa, D. Xaustralis,* and *Thelypteris noveboracensis*, which reach their southwestern range limit in Arkansas, are found mostly in the Ouachita Mountains. Here they occur in moist, shaded, rocky woods along streams and seeps.

Another seven species occur in the Interior Highlands and disjunct along seeps and calcareous microsites of Crowley's Ridge in eastern Arkansas, including *Adiantum capillus-veneris, Adiantum pedatum* subsp. *pedatum, Cystopteris protrusa, Deparia acrostichoides, Diplazium pycnocarpon, Equisetum arvense,* and *Ophioglossum engelmannii. Pilularia americana* occurs in lakes, rivers, and dammed lakes and dammed rivers (impoundments) perched high in the Interior Highlands and along the Arkansas River Valley in western Arkansas. Altogether, 76 species of pteridophytes can be found in the Interior Highlands region of Arkansas.

Special Species Affinities

Some sporadically occurring taxa may be recent adventives while other rare and local species may be Pleistocene relicts. Western species such as *Equisetum laevigatum, Cheilanthes eatonii,* and *Pilularia americana* probably arrived some 7 to 5 thousand years ago during the post-Pleistocene hypsothermal (warming maximum) and have decreased into isolated populations with the cooling of the climate since then. Coastal Plain species which occur at or near the northwestern limits of their ranges in Arkansas are *Dryopteris ludoviciana, Pteris multifida,* and *Selaginella corallina.* Species at the edge of their range and with metropolis areas to the north or northeast in eastern North America include *Dennstaedtia punctilobula, Dryopteris carthusiana, Dryopteris celsa, Dryopteris goldiana, Isoetes engelmannii, Huperzia lucidulum, Osmunda claytoniana*, and *Parathelypteris novaboracensis*. These species occur sporadically in Arkansas where they are at the southwestern extent of their ranges. These Arkansas stations may represent relicts surviving from a once wider Pleistocene distribution or from stragglers of past southern migrations during the multiple Pleistocene glaciations.

In contrast, the northeastern flatbranched clubmoss, *Diphasiastrum digitatum*, which occurs in disturbed woodlands or tree plantations, is interpreted as a recent invader from the northeast from recent long-distance spore dispersal or on rootstock planted into regrowth forests. Similarly, *Lygodium japonicum* and *Macrothelypteris torresiana,* both species not native to the USA, are invading Arkansas from the Southeast into the disturbed pine woods across the southern counties of Arkansas. A similar condition is occurring in our disturbed forested wetlands in southern Arkansas that are now supporting small populations of whiskfern, *Psilotum nudum,* which might have entered from the Southeast as spores in tropical storm events, or in forestry or horticultural soil, or both. *Salvinia minima*, another species not native to the USA, has entered Arkansas in the Delta Region wetlands. The most curious invader is the diminutive *Ophioglossum petiolatum* which has expanded its range across Arkansas southern counties as a frequent lawn weed in rural cemetaries. It original introduction and dissemination may well have been as a weed in potted decorations placed at grave sites, as it has been found in horticultural pots of trees and shrubs in several Arkansas plant nurseries.

The most unusual fern in Arkansas may well be *Trichomanes intricatum.* This endemic species exists in the eastern USA as a gametophyte without a sporophyte generation (Farrar 1992). It was recently proposed (Peck 2011) as occurring in Arkansas based on an anomalous population of *Trichomanes* sp. gametophytes in Stone County. Since then it has also been found in Baxter County [*Peck 99408* (BRIT)]. For many years, the simplest explanation was that this was a relictual New World tropical filmy fern of Triassic age that has persisted in the temperate southeastern USA through the Pleistocene in specially moderated microhabitats called "rockhouses" that accommodated the gametophyte generation but not its sporophyte (Farrar 1998). Evidence for filmy ferns in the southeastern USA during the Triassic is confirmed with fossils (Axsmith, Krings, and Taylor 2001). Recent DNA evidence suggests an alternative phytogeographic origin or relationship, with the nearest

living filmy ferns similar to *T. intricatum* occurring in Asian countries, not Central or South America, belonging to the segregate filmy fern genus of *Crepidomanes* (Ebihara, Ishikawa, Matsumoto, Lin, Iwatsuki, Takamiya, Watano, & Ito 2005; Ebihara, Farrar, & Ito 2008). This genus is restricted to Old World Asian countries. Thus, based on DNA evidence, we are forced into a more elaborate explanation to account for the range and persistence of this sporophyte-less fern species.

Species of Biodiversity Concern

In the Natural Area Plan that summarized Arkansas' biodiversity, Tucker (1976) listed 10 pteridophytes that might be considered endangered or possibly endangered within Arkansas. Since then, with increased attention focused on their status stimulating more field work, some of the species appear to be more common than thought. Clearly, separating species that were under-collected or not well enough known is an important step in identifying species that remain of biological concern based on a continued limited number of county occurrences (Table 18).

Table 18. Based on Tucker (1974), 10 pteridophytes were Endangered or Possibly Endangered in Arkansas.

Tucker's names	Modern names	1974 status	No. of counties 1974	2011
Lycopodium adpressum	Lycopodiella appressa	E	5	21
Lycopodium lucidulum	Huperzia lucidula	E	2	6
Selaginella riddellii	Selaginella coralline	E	2	12
Selaginella rupestris	Selaginella rupestris	E	8	18
Osmunda claytoniana	Osmunda claytoniana	E	2	2
Trichomanes boschianum	Trichomanes boschianum	E	4	5
Trichomanes petersii	Trichomanes petersii	E	2	13
Dennstaedtia punctilobula	Dennstaedtia punctilobula	E	2	4
Woodsia scopulina	Woodsia scopulina	E	1	3
Pilularia americana	Pilularia americana	E	6	14
Equisetum arvense	Equisetum arvense	PE	6	13
Marsilea mucronata	Marsilea vestita	PE	5	9
		Totals	45	120

Based on his dissertation research, Carl Taylor reported 18 species and hybrids of Arkansas pteridophytes that were known from three or fewer counties in Arkansas (Taylor 1976; Taylor & Demaree 1979; Taylor 1984). For these and other species of biodiversity concern (Table 19), collection since 1984 has added appreciably to their known distributions or confirmed that they are truely rare in Arkansas. Two ferns are proposed as extirpated. One species was tracked but no new populations were noted. Twenty-seven species were found at additional sites and in additional counties. With recent discoveries since 1984 (Tables 18 + 19), additional species have been added to the list of Arkansas pteridophytes of biodiversity concern, while others have been removed. Four taxa were discovered in 20 or more additional counties. Nine taxa were discovered in 10 or more additional counties. Nine taxa remain known from 4 or fewer counties.

Table 19. Based on Taylor (1984), 30 native Arkansas pteridophytes were known from 7 or fewer counties in 1984 but most are better known today.

Rare Taxa Known From 7 or Fewer Co. in 1984	Counties Records in 1984	Counties Records in 2011	Status Change
Asplenium ×kentuckiense	1	1	extirpated
Cheilanthes eatonii	2	2	extirpated
Osmunda claytoniana	2	2	unchanged
Dryopteris ×leedsii	1	2	+ 1
Asplenium ×gravesii	1	3	+ 2
Dryopteris carthusiana	1	3	+ 2
Dennstaedtia punctilobula	2	4	+ 2
Pteris multifida	1	3	+ 2
Woodsia scopulina	1	3	+ 2
Argyrochosma dealbata	5	8	+ 3
Dryopteris celsa	3	6	+ 3
Trichomanes boschianum	2	5	+ 3
Huperzia lucidulum	3	6	+ 3
Asplenium ×ebenoides	1	5	+ 4
Parathelypteris noveboracensis	7	12	+ 5
Equisetum arvense	6	13	+ 6
Equisetum laevigatum	1	7	+ 6
Deparia acrostichoides	5	12	+ 7
Pilularia americana	6	14	+ 8
Selaginella coralline	4	12	+ 8
Trichomanes petersii	4	13	+ 9
Marsilea vestita	6	18	+ 13
Lycopodiella appressa	5	21	+ 16
Asplenium pinnatifidum	6	23	+ 17
Ophioglossum nudicaule	4	22	+ 18
Botrychium lunarioides	4	23	+ 19
Thelypteris kunthii	1	36	+ 35
Botrychium dissectum dissectum	2	33	+ 31
Ophioglossum petiolatum	4	55	+ 51
Botrychium dissectum obliquum	7	75	+ 68
TOTALS	88	442	+354

An alternative reason for being known from relatively few counties is being only recently reported from the state. Table 20 lists all native taxa discovered within Arkansas since Taylor (1984). Three species were discovered and already are known from more than 20 counties. The remaining 17 are known from 15 or fewer counties. Eleven are known from four or fewer counties, suggesting that they remain relatively rare in Arkansas. Their presence in few counties as of this report, following 30 years of effort to determine their presence and distribution within Arkansas, now presents strong evidence that they are indeed quite rare in Arkansas.

Table 20. Twenty native taxa were added to the Arkansas pteridophyte flora since 1984. Eleven remain known from four or fewer counties.

Added to flora since 1984	Year Reported	Counties in 2011
Dryopteris ×australis	Orzell & Peck (1985)	4
Dryopteris ludoviciana	Peck et al. (1985b)	3
Pseudolycopodiella caroliniana	Peck & Peck (1986)	9
Lycopodiella alopecuroides	Peck & Peck (1986)	15
Lycopodiella prostrata	Peck & Peck (1986)	8
Lycopodiella ×bruceii	Peck & Peck (1986)	8
Lycopodiella ×copelandii	Peck & Peck (1986)	8
Lycopodiella alopecuroides × prostrata	Peck & Peck (1986)	3
Diphasiastrum digitatum	Peck & Peck (1988)	9
Woodsia obtusa occidentalis	Windham (1993)	43
Cystopteris tenuis	Peck & Taylor (1995)	24
Cystopteris protrusa × tennessensis	Peck & Taylor (1995)	1; unknown
Cystopteris bulbifera × tennessensis	Peck & Taylor (1995)	3; unknown
Palhinhaea cernuua	Bray (1996)	1; extirpated
Dryopteris goldiana	Peck et al. (1999)	4
Dryopteris celsa × goldiana	Peck et al. (1999)	1
Isoetes engelmannii	Thomas et al. (1999)	3
Asplenium montanum	Peck (2011)	1
Asplenium ruta-muraria	Peck (2011)	1
Asplenium septentrianale	Peck (2011)	1
Asplenium ×trudellii	Peck (2011)	1
Athyrium angustum	Peck (2011)	27
Marsilea macropoda	Peck (2011)	2
Trichomanes intricatum	Peck (2011)	2

Exotic Component of Arkansas Fern Flora

Rarity might also be an indication of recent introduction of an exotic, non-native, or non-indigenous species. Non-native but naturalizing ferns were not collected in Arkansas until 1941. By 1984, only 4 non-native species were known in Arkansas and those were in 7 counties. Today, 28 species are present in Arkansas in 338 county occurrences that are escapes to fully naturalized or are not entirely native or are wholely non-native (Table 21). Most occur in southern Arkansas and are more abundant there. Many of those reported by Peck (2011) are only recently escaped and express varying degrees of "naturalization" at varying distances from source plants. This increase in the number of kinds and expansion of their range in Arkansas is a direct result of the availability of exotic hardy ferns and the extent to which gardeners enjoy growing them.

After watching the spread of some species entirely on their own, my attention over the last 10 years was directed toward the garden cultivation of ferns and their escapes and affinities for disturbed safe sites as a result of road maintenance, timber harvest, and wetland management. Species in Arkansas that might exist in native and in naturalized mixtures are *Psilotum nudum* and *Thelypteris kunthii*.

Recent efforts to survey and document their extent of presence in Arkansas also confirmed that they have yet to pose any economic or ecologic damage requiring their listing as invasive plants. The two species with the most obvious human intervention in their occurrence are also the least widespread within the state (*Nephrolepis exaltata* and *Pteris multifidum*). One species was obviously planted around homes in the upland counties, *Matteuccia struthiopteris*, and it persists at many locations with only a few instances where it appears to have appreciable expanded into adjacent wet draws or ravines. Only two species occur as truly aquatic and potentially invasive (*Salvinia minima* and *S. molesta*), but they have yet to demonstrate unmanageable populations in Arkansas. They might be constrained by severe winters or by summer droughts. They should be closely watched. The other exotic ferns in Arkansas are terrestrial to epipetric but favor moist soils at the edges and in openings of disturbed woodlands, particularly in southern Arkansas. The climbing fern *Lygodium japonicum* has not become a serious invasive or increased fire hazards in our pine plantations in southern Arkansas.

The change in distribution of a species range in Arkansas is not restricted to exotics. Some native fern species are also spreading west and south, such as *Diphasiastrum digitatum.* Many of the Gulf Coastal Plain clubmosses in Arkansas appear to be spreading farther northward, but many of the original populations now are on the wane as the site continues to develop into more advanced successional stages. These too are native to Arkansas but certainly have benefited from soil disturbance from barrow pit development and timber access road construction and maintenance.

Table 21. The exotic component (non-native and naturalized) of the Arkansas pteridophyte flora appears to be increasing in the field and is now better documented.

Non-native Pteridophytes	First State Report	Counties in 1984	Counties in 2011
Pteris multifidum	Chandler (1941)	1	2
Ophioglossum petiolatum	Thomas (1978)	4	54
Macrothelypteris torresiana	Taylor & Johnson (1979)	1	17
Thelpteris kunthii	Taylor & Johnson (1979)	1	36
Lygodium japonicum	Taylor (1984)	1	14
Psilotum nudum (in part)	Bray et al. (1994)	-	13
Salvinia minima	Peck (1997)	-	11
Nephrolepis exaltata	Peck (2002)	-	1
Cyrtomium falcatum	Peck (2003)	-	12
Dryopteris erythrospora	Simpson et al. (2006)	-	21
Marsilea quadrifolia	Simpson et al. (2006)	-	3
Arachniodes simplicior	Peck (2011)	-	2
A. niponicum 'Pictum'	Peck (2011)	-	2
Hypolepis tenuifolia	Peck (2011)	-	3
Marsilea mutica	Peck (2011)	-	2
Mattueccia struthiopteris	Peck (2011)	-	23
Polystichum tsus-simense	Peck (2011)	-	3
Phegopteris decursive-pinnata	Peck (2011)	-	1
Salvinia molesta	Peck (2011)	-	2
Selaginella braunii	Peck (2011)	-	2
S. kraussiana	Peck (2011)	-	2
S. k. 'Aurea'	Peck (2011)	-	2
S. k. 'Brownii'	Peck (2011)	-	2

S. k. 'Goldtips'	Peck (2011)	-	2
Selaginella uncinata	Peck (2011)	-	2
Cyrtomium fortunei	Peck (present report)	-	2
Polystichum setiferum	Peck (present report)	-	3
	Total County-level Records	8	338

Future Challenges

Continued field assessments of the rarest Arkansas pteridophytes must be conducted to certify their status in the biodiversity of Arkansas. Twenty-five taxa (20%) of the 123 taxa in the Arkansas pteridophyte flora are known from 5 or fewer counties (Table 22). Three taxa (2%) appear to be of extirpated occurrence (*Asplenium ×kentuckiense*, *Palhinhaea cernuua*, and *Cheilanthes eatonii*). Eight taxa require additional field search. The five clubmosses on the Gulf Coastal Plain are of unknown field status as their populations are short-lived, in early successional status, and are not very stabile (5 clubmosses have 8 or fewer county records). Old collections of uncertain location (two *Cystopteris* hybrids and *Cheilanthes eatonii*) are difficult to access on rocky bluffs. About a dozen are known from less than 20 plants or clones, plus another half-dozen are known from a few hundred plants. Several species have lost complete populations of the few known in Arkansas. The large proportion of the Arkansas pteridophyte flora of precarious status is a stimulus to know more about the species biology of pteridophytes in the Natural State.

Table 22. Floristic status of the 25 rarest native Arkansas pteridophytes found in 5 or fewer counties.

Name	# counties in 2011	Status
Asplenium montanum	1	4 plants
Asplenium ruta-muraria	1	3 plants
Asplenium septentrianale	1	6 plants
Asplenium ×gravesii	1	1 plant
Asplenium ×kentuckiense	1	extirpated
Asplenium ×trudellii	1	1 plant
Cystopteris protrusa × tennesseensis	1	unknown in field
Dryopteris celsa x goldiana	1	1 clone
Palhinhaea cernuua	1	extirpated
Cheilanthes eatonii	2	extirpated
Dryopteris ×leedsii	2	less than 12 plants
Marsilea macropoda	2	2 clones
Osmunda claytoniana	2	2 major clones
Trichomanes intricatum	2	2 major clones
Woodsia scopulina	2	100 plants/extirpated
Asplenium ×ebenoides	3	fewer than 12 plants
Cystopteris bulbifera × tennesseensis	3	unknown in field
Dryopteris carthusiana	3	fewer than 100 plants
Dryopteris ludoviciana	3	1 extirpated; 2 clones
Isoetes engelmannii	3	3 populations
Lycopodiella alopecuroides × prostrata	3	unknown & short-lived
Dryopteris goldiana	4	fewer than 12 plants

Dryopteris ×australis	4	300+ plants
Trichomanes boschianum	4	fewer than 12 clones
Dryopteris celsa	5	1 extirpated/ 200+ plants

When Carl Taylor's field guide to Arkansas ferns and fern allies was published in 1984, he reported 77 kinds of pteridophytes with 1356 county level occurrence records or map dots on the distribution maps. Today, we know of 123 kinds with 3053 dots on the maps. That means that in the last 30 years, an additional 46 kinds of ferns with an additional 1697 county-level dots were added. With the rugged terrain of swamps, outcrops, and bluffs, it is very likely additional kinds and populations await discovery. With each year, new tropical storms bring possibilities of new arrivals. Each collector and flora report summarized what was known at that time, hoping to nudge a successor to continue the collective exploration of Arkansas started so long ago by Thomas Nuttall.

Analysis by County

The Interior Highland Region, comprised of 38 counties, averages 50.5 pteridophytes per county flora and contributes 1917 county records (50.5% of total). The 25 Arkansas counties with the greatest number of pteridophyte kinds in their floras all are within the Interior Highland Region (Table 23). In general, counties with greatest elevation, topographic relief, and largest number of habitat types have the greatest number of pteridophytes. Similarly, rugged topography, particularly narrow and deep East/West running valleys, results in high numbers of pteridophytes known from most counties in the Ozark Region lying north of the Arkansas River. The counties with major aerial extent within the Arkansas Valley Region lowlands have fewer species. Scott County with 36 species in its flora has the least of the county pteridophyte floras within the Interior Highland Region. This may reflect a minimal topographic relief for the region, uniform bedrock, and lower rainfall than found in most Arkansas counties. Adjacent Logan County has but one major feature (Magazine Mountain, 3000+ ft of elevation, greatest in state) that accounts for most of its 53 species. Certainly, mountainous terrain favors pteridophyte occurrences. Interestingly, Garland Co. has the greatest county pteridophyte flora (83) and lies somewhat isolated in the Ouachita Mountain region. All counties with major aerial extent in the Ouachita Mountain Region have high numbers of pteridophytes in their floras, reflecting their rugged rock exposures, marked topographic relief, and a higher rainfall from large fronts and summer air masses arriving from the south and rising to get over the Ouachita Mountains.

The 37 counties of the Interior highlands of Arkansas may be further separated into two regions: the Ozark Region north of the Arkansas River with 25 counties and south of the Arkansas River the Ouachita Mountain Region with 12 counties. The Ozark region counties average 48.7 pteridophytes in their floras while the Ouachita Mountain region counties average 58.4 pteridophytes.

The Interior Lowlands region of Arkansas, comprised of 37 counties, averages 30.6 pteridophytes per county flora and contributes 1136 county records (37.1% of total). The 20 Arkansas counties with the fewest kinds of pteridophytes in their floras all are within the Interior Lowlands, particularly the Mississippi Delta region (Table 24). The counties with the least number of pteridophytes tend to lie to the west of Crowley's Ridge or between Crowley's Ridge and the Mississippi River (Table 24).

Table 23. The top 25 pteridophyte county floras in Arkansas all occur in counties of the Interior Highlands Region.

# Taxa	Counties
82	Garland
73	Pulaski
62	Baxter
61	Stone
60	Montgomery
56	Hot Spring
55	Newton, Saline
54	Clark, Pope
53	Izard, Logan
52	Polk, Van Buren
51	Benton, Cleburne, Independence, Johnson, Marion, Pike
49	Boone, Carroll, Madison
48	Fulton, Washington

Counties that straddle Crowley's Ridge have more species in their diverse microhabitats than those adjacent flat counties with less relief, which are more intensively ditched, drained, and converted to row crops. Counties in the southern Gulf Coastal Plain Region support forestry today, although they once were more agricultural 150–100 years ago. In general, the closer the Interior Lowland counties are to Louisiana or Texas, the greater the number of pteridophytes in their flora. Also, Bradley, Drew, and Union counties have the greatest fern floras of the Interior Lowland counties, being subjected to more scrutiny than the other border counties through the years.

The Interior Lowlands of Arkansas may be separated into two regions: the Mississippi River Delta region (20 counties) and the Gulf Coastal Plain region (18 counties). The Mississippi River Delta counties average 25.8 pterdiophytes in each of their floras, while the Gulf Coastal Plain counties average 32.1. Probably current land use explains much of this pattern, in that the Mississippi Delta was early converted from timber harvest, being ditched and then drained to produce new fields. The new fields were put into cotton and with modern technology into row crops, rice production, with some old field reversion, and conserved swamps for aquifer recharge. The Gulf Coastal Plain is devoted to pine plantation forestry, extractive aggregates, petroleum, gas, and soon lignite, or pasture for ranching, with swamps conserved for aquifer recharge. In the eastern Gulf Coastal Plain, much of it was historically cleared, ditched, and drained for cotton production and has reverted to old field and thence into modern pine timber production. The pteridophytes in these counties are very much restricted to ditches and the few swamps that remain.

Table 24. The 20 smallest pteridophyte county floras in Arkansas all occur in counties of the Interior Lowlands, particularly the Mississippi Delta region.

# Taxa	Counties
20	Mississippi

21	Crittenden, Poinsett
22	Prairie, Woodruff
23	Craighead, Lonoke
24	Cross
25	Chicot, Clay, Monroe, St. Francis
26	Lee
27	Greene, Phillips
29	Arkansas, Desha
31	Jackson
32	Cleveland, Lincoln

Major Herbaria with Arkansas Ferns

There are more than a dozen herbaria in Arkansas with specimens of Arkansas ferns and fern allies. They range in size from the large collection at the University of Arkansas at Fayetteville (approximately 100,000 specimens of vascular plants) to small collections with a few specimens but which might be quite important as they are not duplicated elsewhere.

Specimen vouchers that document the Arkansas flora are also found in herbaria outside Arkansas. The largest holding of Arkansas ferns outside the state of Arkansas is at Fort Worth, Texas (BRIT-SMU-VDB). In the course of preparing this text the author has visited or seen specimens from nearly two dozen herbaria to provide a complete account of the flora and its documentation (Table 25).

Table 25. Herbaria with major holdings of specimens documenting the pteridophyte flora of Arkansas are found within and outside of Arkansas.

Herbarium Institution	ACRONYM or CODE
Arkansas herbaria	
Arkansas Natural History Commission, Little Rock, AR	ANHC
Arkansas Tech University, Russellville, AR	APCR
Henderson State University, Arkadelphia, AR	HSU
Hendrix College, Conway, AR	HXC
University of Arkansas at Little Rock, Little Rock, AR [ferns]	LRU moved to BRIT
Lyon College (Arkansas College), Batesville, AR	"LYON"
Arkansas State University, Jonesboro, AR	STAR
University of Arkansas at Monticello, Monticello, AR	UAM
University of Arkansas at Fayetteville, AR	UARK
University of Central Arkansas, Conway, AR	UCAC
Hot Springs National Park, Hot Springs, AR.	"HSNP"
Out-of-state herbaria	
Botanical Research Institute of Texas, Fort Worth, TX	BRIT
Field Museum of Natural History, Chicago, IL	F
Harvard University Herbaria, Cambridge, MA	A, GH
University of Memphis, Memphis, TN	MEM moved to TENN
Milwaukee Public Museum, Milwaukee, WI	MIL moved to WIS
Missouri Botanical Garden, St. Louis, MO	MO

University of North Carolina, Chapel Hill, NC	NCU
University of Louisiana - Monroe, Monroe, LA	ULM (MLU)
New York Botanical Garden, Bronx, NY	NY
Academy of Natural Sciences, Philadelphia, PA	PH
Southern Illinois University, Carbondale, IL	SIU
Southwest Missouri State University, Springfield, MO	SMS
Southern Methodist University, Dallas, TX	SMU moved to BRIT
University of Tennessee, Knoxville, TN	TENN
University of Missouri, Columbia, MO	UMO
Vanderbilt University, Nashville, TN	VDB moved to BRIT
Museum of Natural History, Smithsonian Institution, Washington, DC	US

The importance of the herbarium collections is greater than their sum. If no one ever made and deposited an herbarium specimen as a voucher, no one could ever know the whole fern flora of Arkansas. No one person has seen all 123 kinds in the wilds of Arkansas. Vouchers were not seriously and systematically collected and archived in Arkansas until the 1920s. Without the many vouchers of Ernest J. Palmer, Delzie Demaree, and Dwight Moore, we would not know the extent of the richness of our natural heritage. Demaree collected more than 70,000 specimens of Arkansas plants. No one since has seen that many, much less collected that many, in Arkansas. Recently, R. Dale Thomas of University of Louisiana at Monroe collected nearly 170,000 specimens, more than anyone else, period. Some of Thomas's collections were ferns from southern Arkansas, particularly the small cemetery ferns found in the genera *Botrychium* and *Ophioglossum*. It is unlikely that anyone else can or will ever repeat or duplicate his total field effort.

The era of the professional plant collector appears to be over within the USA. Workers in agencies and universities are now more concerned with management, restoration, endangered species recovery, or invasive species biology than with alpha level floristics. With the preservation of all past collectors' specimens in herbaria, researchers are rapidly databasing records to assess species and counties that remain under-collected. Stewardship of these potentially forensic holdings of plant vouchers of our flora is now as large a problem as determing what our biodiversity once was.

Over the last 190 years, the pteridophyte floristic research in Arkansas has changed focus and emphasis. Initially, it was to know the names of the plants to be found in the state, then in the 1920s to begin documentation of their county distributions. Since 1980 more attention has been placed on knowledge of population status, knowledge of whether old collections represent now extirpated taxa, and a concern for restoration that requires knowing more about individual species biology. In this century, the management emphasis of exotic invasive and naturalizing species from cultivation to natural areas' exotic species still requires data mining of herbarium vouchers.

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